

ROYAL BOTANIC GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 10]

[1916

XLV.—NOTES ON AFRICAN COMPOSITAE: III.

Pentzia, Thunb.

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(With Plate.)

As limited in Harvey and Sonder's *Flora Capensis*, *Pentzia* and *Matricaria* are not separable by any definite character. We find in the generic key on page 128 of volume iii. that the species of *Pentzia* are characterised as "shrubs or half-shrubs," and *Matricaria* as "annuals, with pinnatisect leaves." But instead of uniting the two genera, as might reasonably be done, it seems better, in order to make as little change in the nomenclature as possible, to recast them by retaining in the South African *Matricaria* only those species with ray-flowers, and transferring the discoid species to *Pentzia*. The latter genus is restricted in distribution to South and South Tropical Africa, whilst *Matricaria* occurs in the Northern Hemisphere with a few representatives in South East Tropical and South Africa. The boreal species of *Matricaria* have predominantly radiate capitula, very few species being discoid. Relying partly on the geographical distribution, therefore, as Bentham has done in the case of *Aster* and *Olearia*, we may distinguish the two genera as follows:—

***Pentzia*, Thunb.**—Capitula discoidea; frutices, suffrutices vel plantae annuae. Distrib.: Afr. austr. trop. et extratrop.

***Matricaria*, Linn.**—Capitula radiata vel species paucae boreales discoideae. Distrib.: Hemisph. bor., Afr. austr. et trop. orient.

The species of *Pentzia* may be arranged conveniently into three sections: I. *Flabellifoliae*, with fan-like leaves toothed or lobed towards the apex and always associated with solitary capitula; II. *Monocephalae*, with much-divided leaves and long-pedunculate solitary capitula; and III. *Corymbosae*, in which the leaves as a rule are much divided and the capitula aggregated into corymbs.

Pentzia is a good example of the large increase in the number of new species which have been discovered since the publication

of the third volume of the Flora Capensis in 1865, wherein there were (together with the discoid species of *Matricaria*) 16 species as compared with 30 in the present revision.

Pentzia, Thunb.—*Clavis specierum.*

- I. FLABELLIFOLIAE, sect. nov.—*Folia plus minusve cuneata vel flabelliformia, apice solum vel apicem versus dentata vel lobulata, dentibus vel lobulis ascendentibus, rarius integra; capitula solitaria, longe pedunculata.*

Folia haud integra:—

Folia usque ad 5 mm. lata, vel latiora et etiam profunde lobulata:—

Folia apice ambitu truncata:—

Folia apice 3-5-fida, basi longe cuneata; pappus nullus... 1. *tortuosa.*

Folia abrupte spathulata, apice undulato-dentata; pappus auriculæformis ... 22. *dentata.*

Folia apice ambitu rotundata:—

Folia 5-fida... 2. *quinquefida.*

Folia inciso-lobulata ... 9. *sphaerocephala.*

Folia 8-15 mm. lata:—

Folia apice ambitu rotundata, multilobulata ... 3. *argentea.*

Folia apice truncata, dentata ... 4. *nana.*

Folia plerumque integra, apice rarius bi- vel tridentata, dense sericea ... 5. *monocephala.*

- II. MONOCEPHALAE, sect. nov.—*Folia pinnatisecta vel decomposita; capitula solitaria, plerumque longe pedunculata.*

Pedunculi demum indurati et spinosi ... 6. *spinescens.*

Pedunculi haud indurati vel spinosi:—

*Pappus plerumque magnus et bene evolutus, auriculæformis:—

Suffrutices vel plantae annuae, parce ramosae, caulibus vel pedunculis elongatis:—

Pappus apice integer; plantae annuae:—

Folia simpliciter pinnatisecta, lobis planis ... 7. *dichotoma.*

Folia bipinnatisecta, lobis satis crassis ... 8. *annua.*

Pappus superne dentatus; caules basi lignosi ... 9. *sphaerocephala.*

Suffrutices multe ramosi, ramulis numerosis pedunculis brevibus apicem versus foliatis:—

Folia petiolata, parte superiori divisa; involucri bractee obtusae ... 10. *incana.*

Folia plerumque e basi divisa; involucri bracteae exteriores angustae, plerumque acuminatae.

Ramuli leviter appresse pilosi vel glabri:—

Receptaculum conicum et post anthesin elongatum ... 11. *Galpinii*.

Receptaculum planum vel leviter concavum vel demum fere globosum.

Folia brevissima, internodiis vix aequilonga vel eos leviter excedentia, segmentis brevissimis; capitula 6-8 mm. diametro ... 12. *globosa*.

Folia internodia multo excedentia, segmentis longissimis filiformibus; capitula circiter 1 cm. diametro ... 13. *pinnatisecta*.

Ramuli dense albo-tomentosi; involucri bracteae interiores conspicue membranaceae ... 14. *lanata*.

**Pappus nullus vel brevissimus, integer vel denticulatus:—

Corollae lobi longiores quam lati, acutissimi, acuminati:—

Involucri bracteae numerosae, angustissimae, marginibus crispato-undulatis, glabrae; corolla 5-lobata; achaenia brevissima ... 15. *acutiloba*.

Involucri bracteae latiusculae et dense pubescentes; corolla 4-lobata; achaeinia obliqua, basin versus angustata ... 16. *intermedia*.

Corollae lobi breves, obtusi, plus minusve triangulares:—

Involucri bracteae dense pubescentes:—

Folia dense sericea; pedunculi elongati, nudi; involucri bracteae fere subulatae ... 17. *albida*.

Folia breviter pubescentia; pedunculi vix elongati, basin versus parce foliati; involucri bracteae exteriores oblongae ... 18. *grandiflora*.

Involucri bracteae glabrae vel fere glabrae:—

Folia simpliciter pinnata:—

Foliorum segmenta satis lata; pedunculi brevissimi; capitula depressa; receptaculum globosum ... 19. *calva*.

Foliorum segmenta subteretia,
angusta; receptaculum conicum ... 20. *hereroensis*.

Folia bi-vel tripinnata, segmentis
angustis; pedunculi graciles,
elongati; capitula globosa ... 21. *globifera*.

III. CORYMBOSAE, sect. nov.—*Folia decomposita, rarius linearia et integra vel flabelliformia; capitula in corymbis confertos aggregata.*

Folia flabelliformia, basi cuneata ... 22. *dentata*.

Folia integra et linearia vel apice trifida ... 23. *Cooperi*.

Folia incisa vel decomposita :—

Pappus auriculæformis, bene evolutus :—

Folia glabra, glanduloso-punctata ... 24. *punctata*.

Folia sericea :—

Folia sicco sulphureo-sericea, lobulis
brevibus obtusissimis; involucri
bractee glabrae ... 25. *elegans*.

Folia sicco cinerea, lobulis acutis;
involucri bractee pubescentes ... 10. *incana*, var.
microcephala.

Pappus nullus vel annularis et brevis-
simus :—

Foliorum segmenta crassa carnosaque,
satis lata :—

Folia brevissima, infra 1 cm. longa 26. *Bolusii*.

Folia matura ultra 1·5 cm. longa :—

Folia simpliciter vel subsimpliciter
pinnatisecta ... 27. *Fenzl*.

Folia bi-vel tripinnatisecta :—

Planta maritima, viscida; capi-
tula circiter 1 cm. diametro 28. *sabulosa*.

Planta non viscida; capitula
plerumque infra 0·5 cm.
diametro ... 29. *tanacetifolia*.

Foliorum segmenta gracilia, filiformia... 30. *pinnatifida*.

1. **P. tortuosa**, *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 174 (1865).

Tanacetum tortuosum, DC. Prodr. vi. 133 (1837); Drège, Zwei Pflanzengeogr. Docum. 52, 53.

SOUTH AFRICA.—Karoo Region: Graaff Reinet; Sneeuwbergen, Dec., *Bolus* 584; Compassberg, Apr., *Shaw*.

Upper Region: Aliwal North; Witte Bergen, damp places, 2000-2300 m. Jan., *Drège*.

A very distinct species with crowded tortuous short branchlets, imbricate leaves and numerous capitula on slender nude peduncles.

Fig 1, branchlet with solitary flower-head, nat. size, leaves and flower enlarged.

2. *P. quinquefida*, Less. Synop. Comp. 266 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 173, partim.

Cotula quinquefida, Thunb. Fl. Cap. ed. Schult. 695 (1823).
Pentzia microphylla, DC. Prodr. vi. 137 (1837).

SOUTH AFRICA.—Upper Region: Philipstown; near Riet Fontein, Waschbanks River, Mar., Burchell 2723. Colesberg; between Riet Fontein and Plettenberg's Beacon, Mar., Burchell 2745. 'South Africa,' Thunberg (type).

Kalahari Region: Orange River Colony; Bloemfontein, Rehmann 3783 (Herb. Mus. Brit.).

Fig. 2, leaf $\times 4$, flower much enlarged.

3. *P. argentea*, Hutchinson, sp. nov. in Ann. S. Afr. Mus., cum icon., ined.

SOUTH AFRICA.—Western Region: Great Namaqualand; Great Karasberg, dry stream slopes (quartz) 65 m. above Wasserfall Alt Ravine (also at Krai Kluff), Jan., Pearson 7927; common in rock crevices between Dabaigabis and Gueindoor, 1400 m., Feb., Pearson 3170; base of Kopje 20 km. N. of Kaman's Drift, Pearson 4529; Bushmanland; stony ground, Jan., Pearson 3832.

A very distinct species with fan-shaped silvery rather deeply lobulate leaves. The description will appear in my enumeration of the late Prof. Pearson's S.W. African *Compositae* in the Annals of the South African Museum.

Fig. 3, leaves showing the variation $\times 3$, achene and ear-shaped pappus enlarged.

4. *P. nana*, Burchell, Trav. in S. Afr. 400 (1822).

P. quinquefida, var. *nana*, Harv. in Harv. et Sond. Fl. Cap. iii. 173 (1865).

Descr. ampl.—*Suffrutex*, basi lignosus; rami abbreviati, inferne petiolorum basibus persistentibus instructi, dense appresse tomentelli, superne dense foliati. *Folia* late cuneato-flabelliformia, apice ambitu truncata et grosse dentata, basi in petiolum 0.7-1 cm. longum attenuata, 1.5-2 cm. longa, 0.5-1.5 cm. lata, crasse coriacea, supra obscure infra conspicue 3-5-nervia, utrinque appresse tomentosa. *Capitula* subterminalia, solitaria, longissime pedunculata; pedunculi nudi, usque ad 15 cm. longi, sulcati, 1-25 mm. crassi, appresse pubescentes. *Involucri bracteae* dorso carinatae, oblongae, apice submembranaceae, obtusae, extra appresse pubescentes. *Corolla* 5-loba, glabra, lobis oblongo-lanceolatis subobtusis. *Achaenia* leviter costata, pappo auriculaeformi brevi coronata.

SOUTH AFRICA.—Kalahari Region: Griqualand West; right bank of the Vaal River at Blaauwbosch Drift, Oct., Burchell 1731 (type).

A very distinct species which has not been gathered since its discovery by Burchell.

Fig. 4, leaf $\times 2$, achene and pappus enlarged.

5. *P. monocephala*, S. Moore in Bull. Herb. Boiss. Ser. II. iv. 1020 (1904).

TROPICAL AFRICA.—Damaraland: Windhoek, *Dinter* 343; Awas Mts., *Dinter* 1252; between Haris and the Awas Mts., on high plateaux, Jan., *Pearson* 9676.

SOUTH AFRICA.—Western Region: Great Namaqualand; Naukluft Mts.; between Goas and Kabiras, on river bank, Jan., *Pearson* 9074; stony plains south of Choaberib, plant strongly aromatic, Jan., *Pearson* 9460.

Fig. 5, leaves natural size.

6. *P. spinescens*, Less. Synop. Comp. 266 (1832); DC. Prodr. vi. 137; Harv. in Harv. et Sond. Fl. Cap. iii. 174.

Osteospermum spinescens, Thunb. Herb., partim, fide Harv. l.c.

SOUTH AFRICA.—Upper Region: Sutherland; at the Great Riet River, Aug., *Burchell* 1380. 'Cape,' *Thunberg* (type); *Masson* (Herb. Brit. Mus.).

7. *P. dichotoma*, DC. Prodr. vi. 138 (1837); Drège, Zwei Pflanzengeogr. Docum. 108. *Matricaria dichotoma*, Fenzl ex Harv. in Harv. et Sond. Fl. Cap. iii. 167 (1865).

SOUTH AFRICA.—Western Region: Little Namaqualand; near Port Nolloth, Aug., *Bolus* 6540; Vaarsche River, *Pearson* 6505. South Western Region: Vanrhynsdorp; Ebenezer; stony dry hillocks below 500 ft., Nov., *Drège* (type).

8. *P. annua*, DC. Prodr. vi. 138 (1837); Drège, Zwei Pflanzengeogr. Docum. 92. *Cotula Teesdaliae*, DC. l.c. 80 (1837); Drège, l.c. 96. *Matricaria albida*, Harv. in Harv. et Sond. Fl. Cap. iii. 166, partim.

SOUTH AFRICA.—Western Region: Little Namaqualand; between Holgat River and the Orange River, 330–500 m., Sept., *Drège* (type); near Concordia, 1100 m., Sept., *Bolus* 9572. South Western Region. Vanrhynsdorp; Zout River, July, *Schlechter* 8124; near Hol River, below 320 m., Aug., *Drège*.

In the Flora Capensis this species was erroneously reduced to *Matricaria albida*, Fenzl (*Pentzia albida*, Hutchinson—see note under that species).

Fig. 8, flower much enlarged.

9. *P. sphaerocephala*, DC. Prodr. vi. 138 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 173.

P. cinerascens, DC. l.c.; Drège, Zwei Pflanzengeogr. Docum. 65, 131. *P. quinquefida*, Harv. l.c., partim.

SOUTH AFRICA.—South Western Region: Uitenhage; Addo, grassy heights in sunny places, 320–640 m., Dec., *Drège* b.

Karoo Region: Willowmore; Kendos Mt., rocky places 1000–1300 m., June, *Drège* a. Graaff Reinnet; mountains near Graaff Reinnet, 1000 m., Apr., fls. yellow, *Bolus* 1069; *MacOwan* 449;

near Graaff Reinet, *Day* (Herb. Mus. Brit.). Somerset; near Little Fish and Great Fish Rivers, 630–930 m., Oct., *Drège a.*

Upper Region: Fraserburg; between Karree River and Klein Quaggas Fontein, near Fraserburg, *Burchell* 1429. Albert; *Cooper* 578.

Kalahari Region: Griqualand West; Asbestos Mts., at the Kloof Village, Feb., *Burchell* 2029.

Eastern Region: Stockenstrom; Katberg, *Shaw* 106. Queenstown; dry slopes near Queenstown, 1280 m., Jan., *Galpin* 1949; Engotini, Jan., *Baur*; Rhinoster River, *Burke*; Shiloh, Mar., 1160 m., *Baur* 790. 'South Africa,' *Harvey*; *Zeyher* 852 (Herb. Mus. Brit.).

On account of considerable variability in the shape of the leaves in this species, it has been entered in two places in the key. Its solitary flower-heads associated with usually much-divided leaves determine its position in the *Monocephalae*, but it forms a decided connecting link between this group and the *Flabellifoliae*, just as *P. dentata* does between the *Flabellifoliae* and the *Corymbosae*.

Fig. 9, cuneate leaves and flower enlarged, divided leaf about natural size.

10. *P. incana*, *O. Kuntze*, Rev. Gen. iii. ii. 166 (1898).

Chrysanthemum incanum, Thunb. Fl. Cap. ed. Schult. 693 (1823). *Pentzia virgata*, Less. Synop. Comp. 266 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 173; Oliv. in Hook. Ic. Pl. t. 2529. *Pentzia cotuloides*, DC. Prodr. vi. 138 (1837).

SOUTH AFRICA.—Western Region: Great Namaqualand; Great Karasberg, Naruda Süd, sandy plains, 1400 m., bush 0·5 m. high, fls. yellow, *Pearson* 7925. Little Namaqualand; between Uitkomst and Geelbekskraal, 620–920 m., Aug., *Drège a*; Nieuwfontein, *Pearson* 3348. Kamies Bergen, *Zeyher* 849, *Pearson* 6598; Plaat Klip, *Pearson* 3484.

South Western Region: Vanrhynsdorp; Windhoek, 100 m., *Schlechter* 8073, Robertson; Kochmann's Kloof, 260–400 m., *Mund* 118. Riversdale; between Zoetmelks River and Little Vet River, Nov., *Burchell* 6842. Knysna; *Pappe*. Uitenhage; *Zeyher* 862.

Karoo Region: Worcester; mts. around Hex River, 960 m., Bolus 5212; Matjes Fontein, Witteberge, *Rehmann* 2934. Beaufort West; *Henderson* 14, 15, 17, 18, 21. Graaff Reinet; plains, *Bowie* (Herb. Mus. Brit.). 'Karoo,' *MacOwan* 585.

Upper Region: Carnarvon; Karee Bergen, 400 m., Aug., *Schlechter* 8194. Murraysburg; Dec., *Tyson* 360 (Herb. Mus. Brit.). Middleburg; plains at Schoombu, 1300 m., Feb., *MacOwan* 1896.

Kalahari Region: Bechuanaland; between Mafeking and Ramoutsa, *Lugard*. Griqualand West; right bank of Vaal River at Blaauwbosch Drift, Oct., *Burchell* 1742. Kimberley, *Rehmann* 3443. Orange River Colony; Bloemfontein, *Rehmann* 3792 (Herb. Mus. Brit.).

'Cape,' *Thunberg* (Herb. Mus. Brit.), *Masson*.

Known as the "Schaap Bosch."

Fig. 10, achene, pappus and flower much enlarged.

Var. **microcephala**, *Hutchinson*. *Pentzia virgata*, var. *microcephala*, Harv. l.c. 174.

Suffrutex diffusus, ramis plerumque procumbentibus, capitulis subcorymbosis parvis.

SOUTH AFRICA.—Karoo Region: Rhenoster Kop, April, *Burke* 528; *Zeyher* 854.

Schlechter 10498 from Bredasdorp Div., distributed under the name *Pentzia rupestris*, Schltr., probably belongs here; it is of more erect habit and with slightly larger heads than the variety.

11. **P. Galpinii**, *Hutchinson*, sp. nov.

Suffrutex e basi lignoso multe ramosus, ramulis erectis vel ascendentibus apicem versus foliatis gracilibus stramineis parce puberulis. *Folia* e basi divisa, pinnatisecta, 0·5–1 cm. longa, segmentis lineari-lanceolatis subteretibus sicco punctatis vel parce puberulis subcarnosis. *Capitula* solitaria, breviter pedunculata, circiter 7 mm. diametro. *Involucri bracteae* 2-3-seriatae, lineares, subacutae, 3–4 mm. longae, superne margine membranaceae, parce pubescentes. *Receptaculum* conicum, acutum, demum 4 mm. longum, minute foveolatum. *Flores* numerosi. *Corollae tubus* 1·75 mm. longus, inferne cylindricus, parce glandulosus, superne subcampanulatus, glaber; lobi 5, ovato-rotundati, 0·4 mm. longi, glabri. *Achaenia* crasse costata, in costis subseriata, pappo auriculiformi albo 0·5 mm. longo coronata.

TROPICAL AFRICA.—Damaraland: Welwitsch, Jan., *Galpin & Pearson* 7672.

12. **P. globosa**, *Less.* Synop. Comp. 266 (1832); DC. Prodr. vi. 137; Harv. in Harv. et Sond. Fl. Cap. iii. 174.

Pentzia globifera, *Lichtenst.* ex *Less.* l.c., nomen.

SOUTH AFRICA.—Karoo Region: Prince Albert; Gamka River, May, *Burke*. Graaff Reinet; *Bolus* (plant covered with insect galls).

Upper Region: Fraserburg; Zak River, Aug., *Burchell* 1492. Murraysburg; open places around Murraysburg, 1300 m., Mar., *Tyson* 333. Colesberg; *Shaw*; *Arnot*.

Kalahari Region: Basutoland, *Hort. Sprenger* 16. Griqualand West; Blaauwbosch Drift, Oct., *Burchell* 1747.

Eastern Region: Albany; near Grahamstown, *MacOwan*. Queenstown; Klaas Smits River, Jan., *Baur* 984; Bradford Drift, 1100 m., Nov., *Galpin* 2631.

'South Africa,' *Zeyher* 850, 851, 853.

Known as the "Karoo Bosch."

13. **P. pinnatisecta**, *Hutchinson*, sp. nov. in Ann. S. Afr. Mus. ined.

SOUTH AFRICA.—Western Region: Great Namaqualand; dry stream beds between Dabaigabis and Gründoorn, bush 1 m., fls. yellow, Feb., *Pearson* 3114; sandy river bed 25 km. north

of Warmbad, bush 0.65 m., fls. greenish yellow, Feb., *Pearson* 4307; Akam River bed, Feb., *Pearson* 4733.

This species is very similar to *P. globosa*, Less., but it has much longer leaves with very long lateral segments and larger capitula; from *P. lanata*, Hutchinson, the description of which will also appear in my account of the *Compositae* of the Percy Sladen Expeditions in the Annals of the South African Museum, it may be distinguished by the much narrower herbaceous inner bracts and less hairy branchlets.

14. *P. lanata*, *Hutchinson*, sp. nov. in Ann. S. Afr. Mus. ined.

SOUTH AFRICA.—Western Region: Great Namaqualand; sandy plains at Schakalskuppe, 1500 m., fls. yellow, Feb., *Pearson* 4781; Great Karasberg Range; sandy bank of dry water course on high plateaux 5 miles S.E. of Wasserfall, Jan., *Pearson* 7926; dry stream bed, sandy plain west of Ganus, Feb., *Pearson* 4488. Inachab, *Dinter* 1201 (Herb. Mus. Brit.).

South-Western Region: Vanrhynsdorp; Knechts Vlagte, 200 m., July, *Schlechter* 8153.

'South Africa,' *Barrett-Hamilton* (Herb. Mus. Brit.).

Except for the conspicuously membranous inner involucre bracts and larger capitula, this new species might be considered a very hairy form of *P. globosa*, Less.

15. *P. acutiloba*, *Hutchinson*, comb. nov.

Tanacetum acutilobum, DC. Prodr. vi. 132 (1837); Drège, Zwei Pflanzengeogr. Docum. 92. *Cenocline acutiloba*, Koch in Bot. Zeit. i. 43 (1843). *Matricaria acutiloba*, Harv. in Harv. et Sond. Fl. Cap. iii. 166 (1865). *Chamaemelum acutilobum*, Fenzl ex Harv., l.c.

SOUTH AFRICA.—Western Region: Little Namaqualand; Orange River banks near Verleptpram, below 160 m., Sept., *Drège*.

Fig. 15. achene and flower much enlarged.

16. *P. intermedia*, *Hutchinson*, sp. nov.

Matricaria grandiflora, var. β , Harv. in Harv. et Sond. Fl. Cap. iii. 166 (1865).

Herb annua usque ad 15 cm. alta, caule simplici vel e basi ramoso pubescenti. *Folia* petiolata, simpliciter vel bipinnata, 1.5–3 cm. longa, 1–2 cm. lata, densiuscule pilosa, lobulis ultimis oblongo-lanceolatis obtusis vel subacutis 0.5–1 mm. longis subcarnosis. *Capitula* longe pedunculata, solitaria, 1–1.5 cm. diametro; pedunculi nudi, 3–7 cm. longi, superne leviter sensim incrassati, sulcati, breviter pubescentes. *Receptaculum* convexum, crebre foveolatum. *Involucri bractee*, 2–3-seriatae, lanceolatae vel oblongo-lineares, subacutae, extra dense pubescentes. *Corollae* tubus medio leviter constrictus, 3.5 mm. longus, glaber; lobi 4, lineari-lanceolati, acute acuminati, 1 mm. longi. *Achaenia* obliqua, basin versus angustatus, minute glandulosa. *Pappus* subnullus.

SOUTH AFRICA.—South-Western Region: Clanwilliam; Hoek, 620 m., Aug., *Schlechter* 8705. "Cape," without collector's name in *Herb. Hooker*.

Fig. 16, flower and achene much enlarged.

17. *P. albida*, *Hutchinson*, comb. nov.

Tanacetum albidum, DC. Prodr. vi. 132 (1837). *Matricaria albida*, Fenzl ex Harv. in Harv. et Sond. Fl. Cap. iii. 166, partim (1865). *Matricaria hirsutifolia*, S. Moore in Bull. Herb. Boiss. Ser. II. iv. 1019 (1904).

SOUTH AFRICA.—Western Region: Great Namaqualand; Angra Pequena, Oct., *Schenck* 22; Inachab, *Dinter* 1221. 'South Africa,' *Zeyher* 837.

Harvey in the Flora Capensis l.c. reduced *Pentzia annua*, DC., to *Matricaria albida*, Fenzl. the latter founded on *Tanacetum albidum*, DC. Amongst the specimens referred to *M. albida* at Kew, I found two species, one with a large pappus as described in the Flora Capensis, and another without a pappus, but otherwise apparently indistinguishable. As De Candolle did not mention a pappus in his description of *Tanacetum albidum*, I suspected that the plant without one was identical with that species. Mr. Casimir De Candolle very kindly examined the type specimen, collected by Drège, and preserved in the De Candolle herbarium at Geneva, and has confirmed my surmise.

18. *P. grandiflora*, *Hutchinson*, comb. nov.

Tanacetum grandiflorum, Thunb. Fl. Cap. ed. Schult. 642 (1823); DC. Prodr. vi. 132; Drège, *Zwei Pflanzengeogr. Docum.* 107. *Cotula tripinnata*, Thunb. l.c. 696. *Cenocline grandiflora*, Koch in Bot. Zeit. i. 41 (1843). *Matricaria grandiflora*, Fenzl ex Harv. in Harv. and Sond. Fl. Cap. iii. 166, excl. var. β (1865).

SOUTH AFRICA.—Western Region: Little Namaqualand; Mt. Spektakel, Nov., *Morris* in *Herb. Bolus* 5732.

South-Western Region: Vanrhynsdorp; Ebenezzer, sand hills below 160 m., Nov., *Drège a*; between Driefontein and Heerenlogement, *Pearson* 6808. Clanwilliam; between Clanwilliam and Lange Kloof, *Pillans* 5345.

Fig. 18, flower and achene, much enlarged.

19. *P. calva*, S. Moore in Bull. Herb. Boiss. Ser. II. iv. 1020 (1904).

TROPICAL AFRICA.—Damaraland: Awas Mts., *Dinter* 290 (*Herb. Mus. Brit.*).

20. *P. hereroensis*, O. Hoffm. in Bull. Herb. Boiss. vi. 751 (1898).

TROPICAL AFRICA.—Hereroland: Haikamchab, Jan., *Galpin* & *Pearson* 7660; mouth of the Tsoachaub River, July, *Dinter*, 32.

Except for having a very rudimentary pappus and not a large ear-shaped one, this species can scarcely be distinguished from *P. Galpinii*, *Hutchinson*. I have not seen the type specimen.

21. *P. globifera*, *Hutchinson*, comb. nov.

Cotula globifera, Thunb. Fl. Cap. ed. Schult. 696 (1823). *Tanacetum obtusum*, Thunb. l.c. 641. *Tanacetum globiferum*, DC. in Deless. Ic. iv. t. 48; DC. Prodr. vi. 132; Drège, Zwei Pflanzengeogr. Docum. 62, 128. *Cenocline globifera*, Koch, Bot. Zeit. i. 41 (1843). *Matricaria globifera*, Fenzl ex Harv. in Harv. and Sond. Fl. Cap. iii. 165 (1865).

SOUTH AFRICA.—Western Region: Little Namaqualand; Port Nolloth, Jan., *Galpin & Pearson* 7650; south of Plaatsklip, *Pearson*, 3505, 3862.

South-Western Region: Swellendam, *Pappe*. Robertson; Kochman's Kloof, Nov., *Mund* 117. Mossel Bay; dry channel of an arm of the Gouritz River, Nov., *Burchell* 6464; between Zout River and Duyker River, Nov., *Burchell* 6370. Uitenhage, *Zeyher*. Port Elizabeth; sand hills and rocky places below 30 m., Dec., *Drège b*; Algoa Bay, *Forbes*.

Karoo Region: Ceres; Ongeluks River, July, *Burchell* 1222. Beaufort West; Nieuwveld Mts., near Beaufort West, 1000-1650 m., Oct., *Drège a*; Beaufort District, *Cooper* 477.

Upper Region: Calvinia; Loeriesfontein, *Pearson* 4842.

Eastern Region: Albany; Slaay Kraal, *Burke*; Fish River heights, *Hutton*; Pluto's Vale, *MacOwan* 256. Queenstown; Shiloh, Dec., *Baur* 963.

'South Africa,' *Mund*, *Thunberg*, *Bowie*, *Thom* 235, 246.

Fig. 21, flower and achene, much enlarged.

22. *P. dentata*, *O. Kuntze*, Rev. Gen. Pl. iii. ii. 166 (1898).

Gnaphalium dentatum, Linn. Sp. Pl. 854 (1753). *Tanacetum flabelliforme*, L'Herit. Sert. Angl. 21, t. 27 (1788). *Pentzia flabelliformis*, Willd. Sp. Pl. iii. 1808 (1800); Drège, Zwei Pflanzengeogr. Docum. 56; Harv. in Harv. et Sond. Fl. Cap. iii. 172. *Pentzia crenata*, Thunb. Fl. Cap. ed. Schult. 637 (1823). *Balsamita flabelliforme*, Pers. Synop. Pl. ii. 408 (1807). *Pentzia flabelliformis*, vars. *Burchellii* et *Burmanni*, DC. Prodr. vi. 137 (1837).

SOUTH AFRICA.—South-Western Region: Worcester; Hex River Valley, at Groote Tafelberg, *Rehmann* 2740. Oudtshoorn; dry hills between Oudtshoorn and Moerass River, 520 m., Dec., *Bolus* 12017. Uniondale; Long Kloof, between Avontuur and the source of Keurbooms River, Mar., *Burchell* 5048; rocky hill near Haarlem, Mar., *Burchell* 4902, 4989.

Karoo Region: Graaff Reinet; near Graaff Reinet, 830 m., Dec., *Bolus* 183.

Upper Region: Richmond; Uitvlugt, near Stylkloof, *Drège a & b*; Great Tafelberg, near Richmond, *Burchell* 2119-3.

Eastern Region: Albany; near Grahamstown, Dec., *MacOwan* 846.

'South Africa,' *Thom* 195, 387, 441; *Forster*; *Wallich* 856; *Burke* 120; *Zeyher* 855; cultivated at Kew in 1777 (Herb. Mus. Brit.).

Fig. 22, young shoot with some heads removed, nat. size, leaves and flower enlarged.

23. *P. Cooperi*, Harv. in Harv. and Sond. Fl. Cap. iii. 173 (1865).

SOUTH AFRICA.—Karoo Region: Somerset East; amongst stones at the top of the Boschberg, 1540 m., July, *MacOwan* 145. Graaff Reinnet; Bamboesberg, 1000 m., Nov., *MacOwan* 585; mountain sides near Graaff Reinnet, Oudeberg, 1500 m., Apr., *Bolus* 585; Sneeuwbergen, 1430 m., Feb., *Bolus* 585 bis.

Upper Region: Middelburg; near Middelburg, *Shaw*. Albert; *Cooper* 628 (cotype). 'Basutoland,' *Cooper* 711 (cotype); banks of streamlet above Buffalo River Waterfall, about 2700 m., Mar., *Galpin* 6705. Barkly East; Doodman's Kranz Mt., Drakensberg, about 2830 m., Mar., *Galpin* 6706; pass below Mont aux Sources, 3000-3320 m., Mar., *Evans* 745.

The leaves of this plant are either entire or trifid at the apex, as shown in fig. 23, nat. size.

24. *P. punctata*, Harv. in Harv. and Sond. Fl. Cap. iii. 172, in syn. (1865).

P. Burchellii, Harv. l.c. quoad descr., non Fenzl.

SOUTH AFRICA.—Upper Region: Fraserburg; between Great Riet River and Stink Fontein, Aug., *Burchell* 1389. Murraysburg; valleys near Coetzier's Kraal, 1450 m., Mar., *Tyson* 399; valleys near Murraysburg, *Tyson* 390. Colesburg; Zuurberg, Dec., *Burke* 503; near Colesburg, 1650 m., *Shaw*. Philipstown; on the Table Mt. near Paarde Bërg, Mar., *Burchell* 2699. 'South Africa,' *Zeyher* 848 (Herb. Mus. Brit.).

Pentzia Burchellii, Harv. (*Tanacetum Burchellii*, DC.) founded on *Burchell* No. 1337, from the Sutherland Div., is a species of *Cotula*, and will eventually probably bear the same specific name under that genus, which is much in need of revision.

25. *P. elegans*, DC. Prodr. vi. 136 (1837); Drège, Zwei Pflanzengeogr. Docum. 65; Harv. in Harv. et Sond. Fl. Cap. iii. 172.

SOUTH AFRICA.—Karoo Region: Laingsburg; Witteberge, Maggissfontein, *Rehmann* 2935. Prince Albert; Zwartberg Pass, about 1500 m., Dec., *Bolus* 11550; foot of Zwartberg Range, Dec., *Bolus* 12016. Willowmore; Kandos Mt., in stony, dry, and rocky places, 1000-1320 m., June, *Drège*.

26. *P. Bolusii*, *Hutchinson*, sp. nov.

Suffrutex decumbens ramosissimus, ramis procumbentibus elongatis angulatis stramineis appresse albo pubescentibus, ramulis elongatis foliatis albo-sericeo-tomentosis. *Folia* petiolata, pinnatisecta, 0.4-1 cm. longa, segmentis carnosius subteretibus apice obtusis mucronulatis primum albo-tomentosis demum subglabris. *Capitula* corymbosa, 5-10-nata, breviter pedunculata, subglobosa, circiter 4 mm. diametro. *Involucri bracteae* 4-seriatae, ab extremo sensim longiores, exteriores triangulari-lanceolatae, subobtusae, interiores oblongae, apice

rotundatae, marginibus late membranaceis, fere glabrae. *Receptaculum* conico-convexum, parvum, minute verrucosum. *Corollae tubus*, 1.25 mm. longus, subcylindricus, parce glandulosus; lobi 5, oblongo-lanceolati, subacuti. *Achaenia* brevissima, angularia, basi callosa, glabra. *Pappus* nullus.

SOUTH AFRICA.—Upper Region: Murraysburg; open places around Murraysburg, Dec., *Bolus* 360.

27. **P. Eenii**, *S. Moore* in Journ. Bot. xxxvii. 401, t. 401 B (1899).

TROPICAL AFRICA.—Damaraland, *Een* 1879; Okanse, *Dinter* 616 (Herb. Mus. Brit.).

28. **P. sabulosa**, *Hutchinson*, comb. nov.

Matricaria sabulosa, Wolley Dod in Journ. Bot. 1901, 399; *Bolus et Wolley Dod* in Trans. S. Afr. Phil. Soc. xiv. 282 (1903).

SOUTH AFRICA.—South-Western Region: Cape; sandy places of Klein Kalk Bay beyond Sea Point, Oct., *Wolley Dod*, 3421.

Fig. 28, leaf, nat. size, flower much enlarged.

29. **P. tanacetifolia**, *Hutchinson*, comb. nov.

Cotula tanacetifolia, Linn. Syst. Veg. ed. xii. 564 (1767). *Tanacetum multiflorum*, Thunb. Fl. Cap. ed. Schult. 642 (1823); DC. Prodr. vi. 132. *T. leptolobum*, DC. l.c. 133 (1837). *T. fruticosum*, Harv. in Harv. et Sond. Fl. Cap. iii. 166, nomen in syn., errore Linn. attrib. *Matricaria multiflora*, Fenzl ex Harv. l.c. 166 (1865), incl. var. *leptoloba*, Harv.; *Bolus et Wolley Dod* in Trans. S. Afr. Phil. Soc. xiv. 282 (1903).

SOUTH AFRICA.—Western Region: Little Namaqualand; near Ookiep, Oct., *Bolus* 5733; Brakwater, *Pearson* 6072.

South-Western Region: Clanwilliam; sandy cornlands, *Pillans* 5340. Tulbagh; Vogel Vallei, below 320 m., Oct., *Drège a.* Cape; Sea Point, Sept., *Wolley Dod* 1882; Nov., *MacOwan* 1894; Green Point, *Hooker* 142; Camps Bay, Dec., *Burchell* 309.

Upper Region: Calvinia; various localities, *Pearson* 3079, 3971, 3969, 4086. 'South Africa,' *Villette*.

Locally abundant on the Cape Peninsula at Sea Point, Paarden Island, Simon's Town, and Miller's Point; rare in Chapman's Bay—*Bolus & Wolley Dod*, l.c.

Fig. 29, leaf, nat. size, flower much enlarged.

30. **P. pinnatifida**, *Oliv.* in Hook. Ic. Pl. t. 1340 (1881).

SOUTH AFRICA.—Eastern Region: Natal; Inanda, Aug., *Wood* 168 (type); stony places, Botha's Hill, 800 m., Oct., *Wood* in Herb. *MacOwan* 1880; fields at Botha's Hill, 1450 m., Nov., *Tyson* 3111. 'Natal,' *Gerrard*.

Fig. 30, leaf, nat. size, achene enlarged.

var. **chenoleoides**, *Hutchinson*, var. nov., a typo foliis brevioribus segmentis subteretibus, ramulis junioribus axillaribus abbreviatis dense pilosis differt.

SOUTH AFRICA.—Eastern Region: Pondoland; Faku's Territory, *Sutherland*. East Griqualand; top of Mt. Currie, 2400 m., May, *Tyson* 1254. Natal; stony hill near Murchison, May, *Wood* 3110; near Curry's Post, Apr., *Wood* 1007 (Herb. Mus. Brit.).

Both the species and variety show a very decided affinity and close generic connection with *Athanasia*, especially with *Athanasia acerosa*, Harv., but the receptacular paleae characteristic of that genus are lacking. The variety is very similar to certain species of the genus *Chenolea* (*Chenopodiaceae*).

Species non visa.

Matricaria Schlechteri, *Bolus ex Schlechter* in Engl. Bot. Jahrb. xxvii. 208 (1899).

SOUTH AFRICA.—South-Western Region: Clanwilliam; Lambert's Bay, near the sea-shore, Aug., *Schlechter* 8540.

I have not seen an example of this species, which is described as having discoid capitula, and must therefore be included in *Pentzia* according to the definition of the genus in the present paper. From the description it appears to belong to the group *Flabellifoliae*.

Explanation of the Plate.—The numbers of the figures correspond to the number preceding the species in the text, where the enlargement is given.

XLVI.—CONIFEROUS TIMBERS: III.

THE ASIATIC PINES.

W. DALLIMORE.

The genus *Pinus* is well represented in Central and Northern Asia, although several of the species are less well known than the European and N. American members of the same family; in fact some of them have but recently been introduced to the British Isles, and little is known of their economic importance or their ability to withstand the climatic conditions prevailing in this country. Several species found in N.W. Asia, and others found in Asia Minor, are common in Europe, and as they were dealt with in an article in *K.B.* No. 6, 1915, they are omitted from the present notes.

The best-known Asiatic species are:—

P. Armandi, Franchet; *P. Bungeana*, Zuccarini; *P. densiflora*, Sieb. & Zucc.; *P. excelsa*, Wallich; *P. Gerardiana*, Wallich; *P. Khasya*, Royle; *P. koraiensis*, Sieb. & Zucc.; *P. longifolia*, Roxburgh; *P. Massoniana*, Sieb. & Zucc.; *P. Merkusii*, Jungh & de Vriese; *P. parviflora*, Lambert; *P. Thunbergii*, Parlatore.

They differ a good deal in size and habit, as well as in commercial importance, though inaccessibility and difficulty of extraction in several cases has doubtless more to do with the

absence of the timber of certain species from the market, than the quality of the wood. A number of the Asiatic pines are grown for ornamental purposes in the British Isles, but it is doubtful whether any serious attempt has been made to establish them here under silvicultural conditions.

P. Armandi, Franchet.—Fruit Pine, Cow Pine.

In general appearance there is a great resemblance between this Chinese pine and *P. excelsa*, but in the leaves of this there is a more decided twist than in the leaves of the Himalayan tree and the cones are broader in comparison with their length. In N. and N.W. China it is said to grow 50–60 ft. high, and the wood is used for building purposes and the coarser kinds of furniture. The seeds are edible, and are used as food in some parts of China. It was introduced to the British Isles barely 20 years ago, and the largest trees in the country, about 20 ft. high, are growing at Kew. The species does not appear to possess commercial possibilities.

P. Bungeana, Zuccarini.—Lace Bark Pine.

This is a very distinct and ornamental pine from N. China, where it forms a fine tree 80–100 ft. high and up to 12 ft. in girth, conspicuous by reason of the white or grey colour of the bark of old trees, and by the brown bark of young trees being shed in small plates disclosing green young bark beneath, thus giving trunks and branches a peculiar mottled character. The leaves are bright green, resinous, and produced in threes. Two forms appear to be in cultivation in the British Isles, one which is inclined to produce several leaders from low down on the stem, and the other of pyramidal outline with a single leader. Mr. E. H. Wilson reports regarding the timber of this tree that the wood is brittle and only used for fuel. Trees in this country are still too young to show the white bark, which is considered to be the most pleasing character of the species, but the young bark is shed in the same way as that of trees in their native country.

P. densiflora, Sieb. & Zucc.—Japanese Red Pine, Female Pine.

In many respects this tree bears a resemblance to the Scots pine, and it occupies the same position of importance with regard to Japanese pines as the Scots pine does to European species. It is known in Japan under the name of *aka-matsu*, and is said to be the commonest conifer in the empire, growing in a variety of soils, except where the land is very wet, between 500–3000 ft. elevation. It varies a good deal in size, and may be found from 50–120 ft. high with a girth of 3–12 ft. The sapwood is yellow and the heartwood reddish. It is described as hard and elastic, rich in resin, and durable against moisture. According to "Forestry in Japan," the timber is highly appreciated for public engineering and mine timber, and is also in abundant demand for building purposes. An interesting fact connected with this tree is that one of the most popular

edible mushrooms of Japan is grown beneath its shade. Although the tree grows well here there is no reason to suppose that it will be of any value for forest planting.

P. excelsa, Wallich.—Bhotan Pine, Blue Pine.

This is one of the best known trees of the Himalaya, and the most satisfactory pine from that region for cultivation in the British Isles. It belongs to the Weymouth pine group, in which the leaves are produced in bundles of five, but is easily distinguished from the Weymouth pine by its longer leaves and larger cones. Gamble, "A Manual of Indian Timbers," says that it is common at altitudes between 6000–12500 ft., sometimes as a pure stand and at other times mixed with *Cedrus Deodara*, *Pinus longifolia*, and other trees. Under the most satisfactory conditions it grows 120–150 ft. high with a girth of 8–12 ft. The timber is considered to be second only to that of the Deodar in usefulness amongst Himalayan Conifers, and is in demand for constructive work, railway sleepers, tea boxes, and other minor uses. It is usually suggested, however, that the wood ought to be treated with a preservative before being used for sleepers. The wood weighs on an average 30–32 lbs. a cubic foot, and in colour the sapwood is yellowish and the heart-wood light red. It is very resinous, and a considerable quantity of resin is extracted from the standing trees, tapping being carried on for three successive years, after which the trees are given at least three years' rest.

P. excelsa grows luxuriantly in many part of the British Isles, and forms a handsome tree when given plenty of room. Examples 60–90 ft. high are fairly common, though there are many trees that develop in width at the expense of height. The branches are more or less horizontal, and as the lower ones grow rapidly in length and diameter, a tree of no great height may cover a wide area of ground. The abnormal development of a few branches may affect the strength of the trunk, and it is not uncommon to find trees with very thin and weak tops, although the branch system of the lower parts of the trees may be strong and vigorous. It is also liable to form several leaders, therefore a strict watch should be kept upon young trees and rival leaders, and very vigorous branches checked in the early stages. Exposure to violent winds appears to injure the upper parts of the trees, those growing in sheltered positions forming finer specimens than others that are moderately exposed. As a woodland tree it would probably prove satisfactory. The timber from trees grown for ornamental purposes is coarse and knotty, the knots being both large and numerous.

P. Gerardiana, Wallich.—Himalayan Edible Pine, Gerard's Pine.

Although this tree was introduced to the British Isles in 1839, very few examples are known to exist, the largest one in England, a specimen under 20 ft. high, is growing in the Cambridge Botanic Garden. In Ireland one has been recorded as being

upwards of 25 ft. high. It is a native of the Western Himalaya, Afghanistan, etc., and at its best grows 60-80 ft. high with a girth of 8-12 ft. The bark is very curious as it is shed regularly in small patches, giving the trunk a peculiar mottled appearance very similar to that of the better known *P. Bungeana*. The wood is very resinous, and of moderately good quality; it is not, however, used very extensively as the trees are preserved as far as possible for the sake of the seeds, which form an important article of food to the natives, and are also roasted and eaten by Europeans. Gamble, l.c., p. 709, says that the tree inhabits dry and arid regions in isolated areas of no great extent, at altitudes generally between 6000-10000 ft. The weight of the wood is given as 44-47 lbs. a cubic foot.

P. Khasiā, Wallich.—Khasia Pine.

This is found in the Khasia Hills, Burma, and other places. It grows 60-100 ft. high with a girth up to 8-10 ft. The wood as shown by specimens in Museum III, at Kew, is resinous and brownish in colour. It looks to be of fairly good quality, but Gamble, l.c., p. 709, suggests that as a building timber it is not very durable. Its resinous character has led to its use for torches, and it is popular for fuel. There does not appear to be any possibility of its becoming of any importance to the timber merchant. It produces resin of good quality.

P. koraiensis, Sieb. & Zucc.—Korean Pine, Siberian Yellow Pine, Kedr.

A good deal of attention has been paid to this tree during the last few years, for it is one of the most important coniferous timber trees of Asia. It is widely distributed in Eastern Siberia, Korea, Manchuria, Japan, etc., where, at its best, it is 120-150 ft. high with a trunk 8-9 ft. in girth. The leaves are in bundles of five, and their arrangement, together with the downy young bark, is suggestive of *P. Cembra*, the cones, however, are double the size of those of that species, and they have very distinct scales. During the last few years attention has been directed to the timber for general use, and in addition to a good deal being shipped to Australia several cargoes were received in this country before the outbreak of war under the name of Siberian yellow pine. The wood left little to be desired in the matter of quality, for it was of good size and apparently equal to European pine and American white pine in quality, but heavy freight charges were against it, and a Liverpool merchant in discussing the timber gave the freight as £7 10s., a standard from E. Siberian ports as against £2 2s. 6d., a standard from Canada to Liverpool. The tree is hardy in the British Isles, but is not likely to be of value for forest planting. For further information regarding this pine see *K.B.*, 1914, p. 199.

P. longifolia, Roxburgh.—Long-leaved Pine, Chir.

Although the timber of this tree is considered to be inferior in quality to that of the blue pine, it is a useful species as a

timber producer, whilst it is the most important resin-producing conifer of N. India. A native of the Himalaya it occurs between 1500–7500 ft. elevation in the west, but is said to ascend little over 3000 ft. in the east. At its best it forms a very large tree with a straight trunk, but in some districts the trunk is said to twist badly, making it of little value for constructive work. The better classes of timber are used for building purposes, whilst the wood is reported as making good charcoal. It has also been suggested that it would answer very well for railway sleepers if creosoted. Large quantities of resin are collected annually from this species, and Gamble reports, l.c. p. 707, that in a good season a tree will generally give about 12 lbs. of resin. It occurs over a considerable area of country, often as a pure stand, and belongs to the three-leaved group of the genus, being easily recognised by its leaves often exceeding 9 in. in length, and by its large woody cones. A good series of specimens of resin, turpentine, and other products may be seen in Museum III. at Kew. In "Indian Forest Utilization," by R. S. Troup, 1907, p. 169, reference is made to this and other resin-producing pines of India as follows:—"In India systematic tapping of *Pinus longifolia* has been carried on for several years in the Himalayas; this species does not produce the best quality of resin, the turpentine being inferior to that of several other pines for making varnish owing to the difficulty with which it dries, but as the tree is plentiful and accessible the tapping of it is highly remunerative, while the existing demand for the turpentine for medical purposes testifies to its purity. The Indian pines which produce the best quality of resin are *Pinus Khasya*, found in Assam and Burma, and *P. Merkusii*, occurring to a limited extent in Burma; these two pines are for the most part situated in remote places, so that the cost of transport has hitherto largely prohibited their remunerative tapping. *Pinus excelsa* produces resin less freely than *P. longifolia*, but the turpentine and colophony obtained from it are of rather better quality." The species is too tender for the British Isles, and the timber is not likely to find a market outside India and adjacent countries.

***P. Massoniana*, Sieb. & Zucc.**

This is a native of S. China, and of no value outside its native country. It is too tender for general cultivation in the British Isles, and trees found under that name are usually wrongly named. Under normal conditions it forms a large tree, and the timber is used locally.

***P. Merkusii*, Jungh & de Vriese.**

This pine is found in the Malay Archipelago, where, under suitable conditions, it attains a height of 60–100 ft., with a girth of 6 ft. or so. The wood is heavy, of good quality, and rich in resin, but the tree is not sufficiently common to be of much commercial value, whilst difficulties of extraction render it unlikely that the timber will ever be of general use. It produces resin of good quality.

P. parviflora, Lambert.—Japanese. White Pine.

Although not an imposing tree as seen in the British Isles, this, the "himeko-matsu" of Japan, is said to be the most conspicuous feature in certain parts of that country, where, according to "Forestry in Japan," it spreads over the mountain ranges of Iwashiro, starting from an elevation of 1600 metres, along the borders of Kozuke and Echigo, and in Tsushima and Shiribeshi, Hokkaido. A form of the tree is also found in the Kurile Islands. It belongs to the group bearing leaves in bundles of five, and is usually met with 50-60 ft. high, although it sometimes attains a height of 100 ft. The wood is considered to be less useful than that of other Japanese pines, and is only used locally. As heavy coning commences very early in life growth is often checked, and trees in this country usually present a stunted appearance and are not very ornamental.

P. Thunbergii, Parlatores.—Japanese Black Pine.

Next to *P. densiflora* this is the most important pine in Japan, where it grows 100-120 ft. high with a girth of 12-20 ft. The leaves are in pairs 3-4 in. long, and the cones, which are 2-2½ in. long are often produced in large clusters, 40-65 cones having been counted in individual clusters. Moreover, male and female flowers may sometimes be found in the same cluster. In Japan it is known by the name of "kuro-matsu," and is planted as a wind-break in addition to being useful for reclaiming sand dunes and other purposes. The wood is used for many purposes, but is said to be inferior to that of *P. densiflora*. The tree grows well in the British Isles, and has been used in the Channel Islands and in Ireland as a wind-break near the sea.

XLVII.—CONTRIBUTIONS TO THE FLORA OF SIAM.**ADDITAMENTUM IX.**

Flacourtia lenis, Craib [Bixaceae-Flacourtieae]; ab affini *F. molli*, Hook. f. et Th., petiolis longioribus distinguenda.

Frutex circiter 3-6 m. altus, ramis majoribus spinis armatis (ex Kerr); ramuli juventute densius molliter pubescentes, demum glabri, cortice cinereo-brunneo rarius cinereo obtecti. *Folia* oblonga, oblongo-elliptica vel oblongo-ovata, apice rotundata vel breviter subacuminata, basi rotundata vel cuneata, usque ad 12 cm. longa et 6 cm. lata, chartacea, supra demum costa nervisque lateralibus parce breviter pubescentia, subtus mox costa nervisque molliter pubescentia et ibi demum puberula tantum, nervis lateralibus utrinque 3-5 subtus prominulis, nervis transversis pagina utraque conspicuis vel demum superiore subprominulis, margine crenato-serrata, petiolo ad 1.5 cm. longo molliter pubescente suffulta; stipulae parvae, mox deciduae. *Flores* ♀ axillares et terminales vel e ramulis anni prioris orti, saepissime racemosim dispositi, pedicellis ad 8 mm. longis molliter pubescentibus suffulti. *Sepala* ovata, obtusiuscula, 2.25 mm. longa, 1.75 mm. lata, ciliata, utrinque pubescentia. *Discus* 0.25 mm.

altus, glaber. *Ovarium* 1·5 mm. altum, apice in collum brevem et latum angustatum, glabrum; styli 6, recti, persistentes, circa 0·75 mm. longi.

Chiengmai, Doi Sutep, mixed jungle, 330 m., Kerr 1700.

Polygala Lacei, Craib [Polygalaceae]; a *P. cardiocarpa*, Kurz, capsulis longioribus, ala pro rata angustiore, seminibus duplo majoribus tuberculis paucioribus majoribus ornatis differt.

Herba 12-20 cm. alta, caule angulato glabro stramineo vel rubro-brunnescente, ramulis lateralibus satis validis. *Folia* iis *P. umbonatae* similia. *Racemi* 8-13 cm. longi, pedunculo communi ut rachidi angulato circa 1 cm. longo suffulti; bractee deciduae, pedicellis subaequales; pedicelli 1 mm. longi. *Sepala* aliformia elliptica vel ovato-elliptica, stipite brevi incluso 3·5 mm. longa 2·5 mm. lata, alia circa 1·25 mm. longa. *Corolla* lutea (ex Kerr), 3·5 mm. longa. *Capsula* subrotundata vel quadrato-rotundata, apice subtruncata vel retuso-truncata, 3·5 mm. longa et ala inclusa usque ad 4·25 mm. lata, ala superne (ubi latissima) 0·75 mm. lata inferne latitudine gradatim decrescente ornata; semina nigra, tuberculis pro rata magnis ornata, carunculis exclusis 1·25 mm. longa, glabra, ut in genere albo-carunculata et etiam ad chalazam umbone nigro nitido haud tuberculato vix vel paulo prominente ornata.

Doi Chieng Dao, on rocks, 1650-1770 m., Kerr 2889.

Distr. Upper Burma, Ruby Mines, Lace.

Polygala umbonata, Craib [Polygalaceae]; a *P. furcata*, Royle et *P. hyalina*, Wall., seminibus ad chalazam arillo conspicuo atro nitido seminibus subdimidio brevioribus ornatis, et a *P. cardiocarpa*, Kurz, seminibus pubescentibus distinguenda.

Herba annua, 15-20 cm. alta; caulis viridis, canaliculatus, glaber, apice furcatus, ramulis paucis lateralibus brevibus tenuioribus evolutis. *Folia* lanceolata, oblongo-lanceolata vel ovato-lanceolata, apice acuta, mucronata, basi in petiolum angustata vel plus minusve distincte acuminata, usque ad 6 cm. longa et 2·5 cm. lata, membranacea, supra viridia, sparsissime nisi ad marginem ubi densiuscule setulosa, subtus pallidiora, glabra, nervis lateralibus utrinque 4-6 supra conspicuis subobscurisve intra marginem arcuatim conjunctis et nervum continuum intramarginalem saltem superne formantibus, petiolo ad 1 cm. longo suffulta. *Racemi* glabri, usque ad 3·5 cm. longi, pedunculo communi 1·5-2·5 cm. longo suffulti; bractee angustae, pedicellos paulo superantes, sub anthesin deciduae; pedicelli graciles, 1-1·5 mm. longi. *Sepala* duo aliformia elliptica, stipite brevi incluso 3·5 mm. longa, 2·5 mm. lata, alia 1·5 mm. longa. *Corolla* sulphurea (ex Vanpruk), 4 mm. longa. *Capsula* magis minusve rotundata, ala inclusa 3-3·5 mm. diametro, ala apice latissima vix 0·5 mm. lata, inferne latitudine decrescente et ima basi vix evoluta; semina (carunculis exclusis) nigra, pubescentia, minute copiose tuberculata, 1·25 mm. longa, ut in genere albo-carunculata praetereaue ad chalazam carunculo atro nitido pubescente haud tuberculato 0·75 mm. longo ornata.

Prê, Hue Tuam, 270 m., Vanpruk 328.

Distr. Upper Burma, *Lace* 5477; S. Shan States, Loi Mwe, 1650 m., *MacGregor* 21.

Paramignya rectispinosa, *Craib* [Rutaceae-Aurantieae]; ab affini *P. Griffithii*, *Hook. f.*, spinis rectis vel subrectis fere 2 cm. longis distinguenda.

Frutex sarmentosus; ramuli virides, tenuiter pubescentes, mox puberuli, ad 3.5 mm. diametro; spinae axillares, rectae vel subrectae, ad fere 2 cm. longae, virides nisi apice stramineae, pubescentes. *Folia* oblonga vel oblongo-oblancoolata, apice obtuse acuminata, basem versus gradatim angustata, rotundata, 10.5–14 cm. longa, 2.8–4.7 cm. lata, rigide chartacea, pagina superiore nisi costa praecipue inferne tomentella rarissime subglabra glabra, inferiore molliter pubescentia, copiose pellucido-punctata, nervis lateralibus utrinque circiter 15 intra marginem vix conspicue anastomosantibus supra subconspicuis subtus prominulis; petioli 1–1.1 cm. longi, supra canaliculati, indumento ut ramuli tecti. *Flores* albi (ex *Kerr*), solitarii, pedicellis circiter 3 mm. longis parcius breviter pubescentibus paulo supra basem bracteolis parvis instructis suffulti. *Calyx* 2 mm. longus, extra pubescens, intra glaber, lobis 5 deltoideis vel anguste deltoideis obtusiusculis tubo paulo brevioribus. *Petala* oblonga, 1.2 cm. longa, 3 mm. lata, glabra, conspicue glanduloso-punctata. *Filamenta* 8 mm. longa, pubescentia, ut petala glandulosa, antheris 2 mm. longis. *Discus* calyce paulo brevior. *Ovarium* circa 1 mm. altum, densius pubescens, stylo 7 mm. longo pilis divergentibus instructo, stigmate capitato.—*Atalantia Griffithii*, *Craib*, *Contrib. Fl. Siam in Aberd. Univ. Studies* No. 57, p. 33 *via* *Paramignya Griffithii*, *Hook. f.*

Chiangmai, Doi Sutep, evergreen jungle, 660 m., *Kerr* 1718.

Paramignya Surasiana, *Craib* [Rutaceae-Aurantieae]; a *P. monophylla*, *Wight*, filamentis haud glabris facile distinguenda.

Frutex scandens; ramuli 3 mm. diametro, puberuli, cortice viridi parum striatulo obtecti; spinae recurvae, 7–9 mm. longae, apice stramineae, inferne virides vel stramineo-virides. *Folia* saepius obovata vel elliptico-obovata, apice obtuse caudato-acuminata, basi late cuneata vel rotundata, 10–14 cm. (acumine ad 1 cm. longo incluso) longa, 5.2–7.5 cm. lata, chartacea, costa subtus parce breviter pubescente excepta glabra, glandulis satis crebris pagina inferiore conspicuis, subtus pallidiora, nervis lateralibus utrinque saltem 10 saepissime rectis intra marginem anastomosantibus supra conspicuis vel subconspicuis subtus prominulis, petiolo 1.5–1.7 cm. longo puberulo suffulta. *Pedicelli* circa 4 mm. longi, inferne parvi-bracteolati. *Alabastra* oblonga, apice rotundata, ad 1.4 cm. longa. *Calyx* 5.5 mm. longus, extra ut pedicelli crispatis pubescens, intra adpresse pubescens, lobis quoad longitudinem inter se parum inaequalibus 1–2.5 mm. longis apice rotundatis ciliolatis. *Petala* alba (ex *Kerr*), omnia manca, saltem 1.7 cm. longa, glabra. *Filamenta* 1.2 cm. longa, angulata, apice albo-pubescentia, medio bifacialiter albo-pubescentia, ima basi fere glabra. *Ovarium* breve, dense pubescens, stylo circiter 9 mm. longo pubescente.

Chiengmai, Doi Suteh, evergreen jungle, 1650 m., *Kerr* 2542.

The fruiting specimen collected at Pegu by McClelland and included in Fl. Brit. Ind. under *P. Griffithii* is rather referable to this species.

Osbeckia Garrettii, *Craib* [Melastomaceae-Osbeckieae]; ab affini *O. crinita*, Benth., foliis tenuioribus supra sparse setosis, ramulorum setis patulis haud adpressis facile distinguenda.

Ramuli obtuse quadranguli, cinereo-brunnei, setis satis longis basi tumidis divergentibus subdense instructi, 2-2.5 mm. diametro. *Folia* oblongo-lanceolata lanceolatae, apice acute acuminata, basi obtuse cuneata, 5-10 cm. longa, 1-2.8 cm. lata, chartacea, pagina superiore sicca viridia, setis adpressis sparse instructa, inferiore parum pallidiora, ad nervos sparse longius setosa, e basi 5-nervia, nervis inter se ad imam basem liberis supra immersis subtus prominentibus, nervis transversis satis numerosis inter se plus minusve parallelis supra parum immersis subtus gracilibus prominulis, margine integra vel subintegra, petiolo 3-4 mm. longo adpresse setoso supra canaliculato suffulta. *Paniculae* terminales, subcongestae, parce ramosae, breves, floribus sessilibus; bracteae plus minusve ovatae, apice acutiusculae acuminatae, 4-6 mm. longae, extra medio sparse setosae, intra glabrae, margine longius setoso-ciliatae. *Receptaculum* 9 mm. altum, extra setis basi tumidis solitariis vel per 2-3 aggregatis saepissime sessilibus sparse tectum praeterea pilis per brevibus nitidis quasi glandulas elongatas simulantibus parce instructum. *Calycis* tubus 0.75 mm. longus, segmenta 5.5 mm. longa, 0.5 mm. lata, apicem versus gradatim angustata, summo apice acuta, glabra nisi margine distanter longe setoso-ciliata, cum setis solitariis vel appendiculis brevibus apice setosis haud glanduliferis alternantia. *Petala* 4, oblongo-elliptica vel subelliptica, vix unguiculata, 1.6 cm. longa, 9 mm. lata, ciliolata. *Stamina* 8, circa 2 cm. longa, antheris filamentis subaequilongis. *Ovarium* ambitu oblongo-ovatum, apice conico hirsuto incluso 4.5 mm. longum; stylus circa 1.8 cm. longus.

Doi Intanon, 1050 m., *Garrett* 51.

Osbeckia paludosa, *Craib* [Melastomaceae-Osbeckieae]; ab *O. cinerea*, Cogn., calycis lobis angustioribus, ab *O. stellata*, Don et *O. crinita*, Benth., ramulorum indumento denso haud adpresso inter alia differt.

Frutex circiter 1.8 m. altus (ex *Kerr*); ramuli dense cinereo-vel pallide ferrugineo-vel ferrugineo-hirtuli, pilis primo patulis mox deflexis persistentibus, obtuse quadrangulares. *Folia* oblongo-lanceolata, oblongo-ovata vel rarius oblonga, apice acuta vel brevissime acute acuminata, basi rotundata vel interdum subtruncata, 2.4-6 cm. longa, 1.2-3 cm. lata, chartacea vel chartaceo-coriacea, pagina superiore primo subsericea, mox adpresse pilosa, inferiore sicca lutescentia, molliter pubescentia pilis plus minusve adpressis nisi ad nervos longioribus rigidioribus et divergentibus, 5-7-nervia, nervis ad imam basem liberis pagina superiore impressis inferiore prominentibus, nervis transversis sat numerosis inter se parallelis supra parum impressis subtus

prominulis, margine inconspicue serrulata vel integra, ciliata, petiolo 1-4 mm. longo eodem indumento ae ramulis oblecto suffulta. *Flores* purpurei (ex *Kerr*), in paniculas terminales e spicis plerumque simplicibus ad 8 cm. longis compositas dispositi; bracteae deciduae, ovatae vel late ovatae, 3.5-4.5 mm. longae, dorso strigosae, intra glabrae, strigoso-ciliatae. *Receptaculum* 9 mm. altum, appendiculis filiformibus setosis subdense hirsutum. *Sepala* 4, lineari-lanceolata, apice attenuato-acuminata, 6-7 mm. longa, 1.75-2 mm. lata, extra paucisetosa, intra glabra, longe ciliata, cum appendiculis filiformibus setosis alternantia. *Petala* 4, obovata, apice rotundata, ad 2.2 cm. longa, 1.6 cm. lata, apice pauciciliata. *Antherae* 1 cm. longae, connectivo basi parum producto paucisetoso, filamentis 9 mm. longis suffultae. *Ovarium* 6.5 mm. altum, apice anguste conicum, setosum, stylo 2-2.1 cm. longo.

Doi Sutep, open marshy ground, 330 m., *Kerr* 2740.

Argostemma plumbeum, *Craib* [Rubiaceae-Hedyotideae]; ab *A. tavoyano*, Wall., foliis apice rotundatis, floribus majoribus, ab *A. courtallensi*, Arn., corollae lobis latioribus, staminibus brevioribus distinguendum.

Herba nana. *Folia* bene evoluta duo, opposita (1-2 multo minoribus interdum additis), aequalia vel inaequalia, prostrata, elliptica vel oblongo-elliptica, apice basique rotundata vel interdum basi latissime cuneata, 2.5-5.5 cm. longa, 1.5-4.5 cm. lata, membranacea, sicco supra fusco-viridia, subtus plumbea, pagina superiore setulis brevibus hic illic instructa vel subglabra, inferiore ad costam nervosque furfuracea et ad nervulos parvis brevissime pilosula, nervis lateralibus utrinque 6-8 saltem superioribus intra marginem arcuatim conjunctis supra obscuris vel fere obscuris subtus prominulis, nervis transversis subtus conspicuis gracilibus, margine breviter ciliolata, petiolo perbrevis furfuraceo suffulta. *Pedunculus* communis 3-4.8 cm. longus, furfuraceo-puberulus, cymam umbelliformem 2-5-floram gerens; bracteae 1-2 mm. longae, deciduae vel persistentes, furfuraceae; pedicelli 5-9 mm. longi. *Receptaculum* breve, setulosum. *Calycis* tubus brevis; lobi 4, oblongi vel anguste deltoidei, 2 mm. longi, 1.25 mm. lati, dorso setulosi, ciliati. *Corolla* alba (ex *Kerr*); tubus 4 mm. longus; lobi breviter acuminati, 2.5 mm. longi, 3.75 mm. lati. *Antherae* 2.25 mm. longae, poris duobus apicalibus dehiscentibus, filamentis 1.5 mm. longis suffultae.

Gorge below Ban Kaw, c. 195 m., on damp rocks in jungle, *Kerr* 2197.

Mussaenda dehiscens, *Craib* [Rubiaceae-Mussaendeae]; a speciebus aliis asiaticis fructu apice loculicide dehiscente recedit.

Arbor 7-8-metralis; ramuli primo adpresse strigosi, plus minusve glabrescentes, mox cortice pallide brunneo vel cinereo-brunneo lenticellato oblecti, praesertim ad nodos compressi, apicem versus plerumque conspicue bifacialiter canaliculati. *Folia* oblanceolata, oblongo-oblanceolata vel ovato-lanceolata, apice acuminata, acuta, basi cuneata, 10-17 cm. longa, 2.5-6 cm. lata, tenuiter chartacea, pagina superiore pilis paucis subrigidis

hic illic instructa sed ad costam nervosque laterales plus minusve adpresse strigillosa, inferiore ad nervulos parce strigosa et ad costam nervosque adpresse strigosa, plus minusve glabrescentia, nervis lateralibus utrinsecus 10 superioribus intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, petiolo ad 1 cm. longo adpresse strigoso supra canaliculato suffulta; stipulae bifidae, 4 mm. longae, aliae persistentes, aliae deciduae. *Inflorescentia* e corymbo terminali multifloro ad 15 cm. diametro constituta, pedunculis inferioribus sub fructu usque ad 9 cm. longis, floribus in ramulis ultimis secundis fere sessilibus, sepalis expansis in inflorescentia quaque 4-6; bracteae persistentes vel deciduae, circa 3 mm. longae, angustae; alabastra acuminata. *Receptaculum* 2 mm. altum, vix 2 mm. diametro, puberulum. *Sepala* normalia deltoidea, acuta, 1 mm. longa, 0.75 mm. lata, ciliata, dorso parce puberula, mox decidua; aucta ovata-lanceolata, late ovata vel saepissime ovata, apice acuta vel obtusa, basi cuneata vel acuminata, usque ad 9 cm. longa et 6.5 cm. lata, e basi 5-nervia, petiolo ad 3 cm. longo supra late canaliculato subtus sulcato suffulta. *Corollae* tubus 1.8 cm. longus, extra adpresse fulvo-hirsutus, intra summo apice dense sulphureo-villosus, inferne pilis paucis sulphureis instructus; limbus 12 mm. diametro, lobis late obovatis dorso infra apicem cornutis. *Antherae* inclusae, vix 3 mm. longae. *Stylus* inclusus, glaber. *Fructus* obovoideus vel ellipsoideo-obovatus, circa 8 mm. longus, apice loculicide dehiscens; semina minuta, angulata, foveolata, exalata.

Wieng Papao, mixed jungle, 510 m., *Kerr* 2522.

Distr. Yunnan, *Henry* 12825. Tonkin, *Balansa* 2683, 2684, *Wilson* 13642 (ex Herb. Henry).

Leptodermis venosa, *Craib* [Rubiaceae-Paederieae]; foliis parvis nervis conspicuis, sepalis longius acute attenuatis cognoscenda.

Ramuli graciles, juventute pilis rigidiusculis prorsus curvatis instructi, mox bifacialiter tantum pubescentes, cortice cinereo tenui cito soluto. *Folia* late lanceolata, oblanceolata lateve oblanceolata, apice breviter acute acuminata, basi in petiolum brevem vel vix distinctum attenuata, 8-20 mm. longa, 4-9 mm. lata, subcoriacea, pagina superiore glabra vel costae basem versus pilis paucis brevibus satis rigidis instructa, inferiore pallidiora, glabra vel ad costam nervosque laterales setulis paucis brevibus instructa, nervis lateralibus utrinsecus 3-5 cum costa supra prominentibus subtus tenuioribus prominulis; stipulae e basi satis lata aristato-acuminatae, 2-2.5 mm. latae. *Flores* ad apices ramulorum brevium gesti, sessiles; bracteolae in tubum late turbinatum 1.25 mm. altum receptaculum laxe cingentem margine ciliatum vel subfimbriatum connatae, longius aristato-acuminatae, aristis tubo paulo brevioribus. *Receptaculum* bracteolarum tubo paulo altius, glabrum. *Sepala* lanceolata, acuminata, 1.5 mm. longa, basi 0.75 mm. lata, rigide setuloso-ciliata. *Alabastra* oblonga, apice pilis paucis rectis satis robustis instructa. *Corollae* tubus 7 mm. longus, extra glaber, intus paulo supra

medium annulo denso lato pilorum ornatus, supra annulum sparsius pilosus; lobi 2.75 mm. longi. *Filamenta* 0.75 mm. longa, antheris paulo exsertis 1.5 mm. longis. *Stylus* inclusus, gracilis, apice bifidis.

Chiengmai, 300 m., cultivated, *Kerr* 3680.

Vaccinium Garrettii, *Craib* [Vacciniaceae-Vaccineae]; *V. Forrestii*, Diels, peraffine, sed corolla intus haud glabra et praesertim eius lobis intus saepe densius pilosis distinguendum.

Arbuscula inflorescentia excepta glabra, ramulis primo pallide brunneis mox cinereis vel cinereo-brunneis. *Folia* obovato-oblancheolata, ovato-lanceolata vel rarius late lanceolata, apice longius acuminata vel attenuato-acuminata, callosa-acuta, basi cuneata vel subrotundata, 4-10 cm. longa, 2-4 cm. lata, coriacea, sicco subtus cupreo-brunnea, nervis lateralibus utrinsecus saepius 6-8 rectis intra marginem anastomosantibus supra parum elevatis vel tantum subconspicuis subtus prominentibus, nervulis inter se satis distantibus subtus prominulis, margine serrulata, petiolo circiter 8 mm. longo supra valde canaliculato suffulta. *Racemi* axillares, ad 7.5 cm. longi, pedunculo communi petiolo subaequilongo vel eo paulo longiore incluso, rhachi cum pedunculo angulata glabra ima basi bracteis pluribus sterilibus persistentibus instructa; bractee late lanceolatae, subulato-acuminatae, circa 8 mm. longae et 3.5 mm. latae, margine glanduloso-fimbriatae; pedicelli glabri, sub anthesi 2 mm. longi, apice cum receptaculo articulati, medio bracteolis duabus subalternis fere 4 mm. longis 2 mm. latis subulato-acuminatis margine irregulariter glanduloso-fimbriato-serratis ornati. *Receptaculum* glabrum, circa 2 mm. altum et 2.5 mm. diametro. *Calycis* tubus fere 0.5 mm. longus; lobi late deltoidei vel ovato-deltoidei, acuti vel brevissime acuminati, circa 1.5 mm. longi et 1.75 mm. lati, apicem versus breviter ciliolati. *Corollae* albiae (ex *Garrett*) tubus 7 mm. longus, extra glaber, intus tenuiter pubescens; lobi vix 1.5 mm. longi. *Stamina* 6.25 mm. longa, filamentis 2.75 mm. longis complanatis piloso-barbatis; antherae dorso aristis duabus 0.75 mm. longis sursum directis ornatae, minute papillosoe. *Stylus* validus, 8 mm. longus, glaber.

Doi Intanon, Pah Ngeam, North Peak, 2165-2170 m., *Garrett* 79.

Nyctanthes aculeata, *Craib* [Oleaceae-Jasmineae]; a speciebus aliis habitu sarmentosa ramulisque aculeatis recedit.

Frutex sarmentosus; ramuli hirsutuli, quadrangulares, ad angulos incrassati et aculeis primo rectis mox recurvis instructi, cortice brunneo vel pallide brunneo obtecti, circa 3-3.5 mm. diametro. *Folia* plerumque oblonga, ovata vel late ovata, apice triangularia vel acuminata, mucronulata, basi cuneata, rotundata vel fere truncata, usque ad 5.5 cm. longa et 5 cm. lata, chartacea, pagina superiore setis rigidis erectis scabrida, inferiore pilis albis satis rigidis adpressis sparsis scabridiuscula, e basi 3-5-nervia; nervis secundariis (e costa ortis) utrinque 1-3 intra marginem furcatis omnibus supra conspicuis interdum parum impressis subtus prominentibus, nervis transversis subtus vix conspicuis vel

subprominulis, margine revoluta, distanter pauci-lobulata vel sinuato-lobulata, lobulis rotundatis interdum mucronatis, petiolo hirsutulo supra canaliculato circa 1 cm. longo suffulta. *Flores* in capitula axillaria solitaria et in cymas trichotomas terminales disposita aggregati; pedunculi 1-3.3 cm. longi, hirsutuli, paulo supra basem hibracteati; bracteae involucrales oblongo-oblancheolatae, circiter 4 mm. longae, satis crassae et rigidae, extra brevius pubescentes, intra glabrae, ciliatae. *Calyx* usque ad basem 5-7-partitus, segmentis lineari-oblancheolatis acutis fere 3.5 mm. longis circa 0.5 mm. latis extra in margine dense longius pilosis intra glabris. *Alabastra* apice pilis erectis brevibus albis instructa. *Corollae* tubus (in alabastro) 1.75 mm. longus; lobi iis *N. Arbortristis* quoad formam similes. *Antherae* 1.25 mm. longae, corollae tubi apicem versus filamentis brevibus insertae. *Ovarium* glabrum, 0.75 mm. altum; stylus stigmatibus bifido incluso vix 2 mm. longo. *Fructus* oblatus, apice emarginatus, acuminatus, 1.3 cm. longus, 2 cm. (alis inclusis) latus; semina solitaria erecta.

Mê Ping Rapids, Ban Kaw, mixed jungle, 220 m., *Kerr* 3066.

***Gentiana (Stenogyne) australis*, Craib** [Gentianaceae-Swertieae]; *G. leptocladae*, Balf. f. et *G. Forrest*, persimilis sed antheris longioribus et seminibus alatis distinguenda.

Herba annua, patens, caulibus viridibus rubescentibusve glabris angulatis mox alis angustis scabridis instructis. *Folia* ovata vel late ovata, basi subtruncata, superiora caulem saepe amplectentia, apice subacuta obtusave, ad 1.3 cm. longa et 1.1 cm. lata, satis rigida, e basi 5-7-nervia, nervis supra conspicuis subtus prominulis, pagina superiore glabra, inferiore ad nervos scabrida, margine recurvo argute denticulata, sessilia vel breviter petiolata. *Flores* purpurei (ex *Kerr*), et axillares et terminales, ramulis lateralibus gracilibus quorum folia quam ea caulium multo minora gesti, inter folia suprema breviter pedicellati. *Calycis* membranacei tubus anguste obconicus, 6 mm. longus, angulis quinque superne subalatis scaberulis; lobi aristati, 5 mm. longi. *Corolla* 2.8 cm. longa, lobis breviter caudato-acuminatis circa 8.5 mm. longis et 3.5 mm. latis, plicis apice fimbriatis quam lobis 3 mm. brevioribus. *Antherae* 3 mm. longae. *Ovarium* 1.1 cm. longum, stipite circa 2.5 mm. longo suffultum, stylo 9 mm. longo. *Capsula* corollam vix aequans; semina brunnea, trigona, anguste sed distincte alata.

Doi Chieng Dao, 1650-1770 m., common on rocky ground, *Kerr* 2865.

***Rivea Collinsae*, Craib** [Convolvulaceae-Convolvuleae]; ab affini *R. ornata*, Choisy, foliis supra haud glabris distinguenda.

Frutex volubilis; ramuli juventute densius albo-hirsutuli, mox parce hirsutuli, cortice brunneo demum longitudinaliter fissi obtecti, lenticellis sparsis vix conspicuis. *Folia* ovata, late ovata vel oblata, apice acuminata, costa excurrente longe apiculata, basi latius cordata, 6-9 cm. longa, 7-10.5 cm. lata, chartacea, pagina superiore pilis brevibus rigidiusculis adpressis marginem versus brevioribus densioribus, inferiore pilis longiori-

bus adpressis nisi ad costam nervosque sparsioribus instructa, nervis lateralibus utrinque 8–10 rectis intra marginem furcatis ramulis prope marginem arcuatim conjunctis supra conspicuis vel subprominulis subtus cum costa prominentibus, margine ciliata, petiolo 3–7 cm. longo sulcato suffulta. *Inflorescentia* axillaris, pluriflora, 5–6 cm. longa, pedunculo, rhachi, pedicellis bracteisque sparsius adpresse hirsutis; bracteae deciduae, lanceolatae oblanceolatae, acutae vel attenuato-acuminatae, circa 1.5 cm. longae et 3 mm. latae. *Sepala* 5, oblonga vel ovata, apice rotundata, 1.3–1.4 cm. longa, 0.9–1.2 cm. lata. *Corolla* purpurea et alba, 5.5 cm. longa, glabra. *Filamenta* 1.8 cm. longa, basi albo-hirsuta, antheris 5 mm. longis. *Stylus* gracilis, 3.8 cm. longus, stigmatibus bifido, lobis ambitu oblongo-rotundatis; ovarium disco cupulari brevius. *Fructus* plus minusve globosus, sepalis persistentibus extra brunneis intra stramineis circa 1.7 cm. longis; semina 4, pallide brunneo-pilosa.

Srirācha, 0.4–5 m., *Kerr* 2149, *Mrs. D. J. Collins* 53.

Boca Kerrii, *Craib* [Gesneraceae-Cyrtandreae]; a *B. Swinhoei*, Hance, cui peraffinis, foliis majoribus longius petiolatis, cymis laxioribus, pedicellis longioribus, inter alia recedit.

Caules erecti, simplices, rarissime ramosi, 54–70 cm. alti, inferne lignosi, fistulosi, primo cinnamomeo-pannoso-arachnoidei. *Folia* opposita, quoad formam parum variabilia, plerumque oblonga vel elliptico-oblonga vel ovata, apice saepissime subacuminata, acutiuscula, basi in petiolum attenuata, cuneata vel acuminata, 6–17 cm. longa, 3–7.5 cm. lata, membranacea vel chartaceo-membranacea, pagina superiore mox fere glabra, inferiore persistenter cinnamomeo-arachnoidea, nervis lateralibus utrinque 10–14 marginem versus prorsus curvatis et ibi superioribus arcuatim conjunctis supra conspicuis vel subconspicuis subtus cum costa prominentibus, nervulis sparsis subtus prominulis, margine minute crenato-denticulata vel subintegra; petioli distincte alati, 1.5–7.5 cm. longi, illi paris utriusque inter se aequilongi vel inaequilongi, basi commisura conjuncti. *Cymae* laxae, et axillares et terminales, per plantae partem dimidiam superiorem fere distributae; pedunculi communes 2–3.5 cm. longi, partiales 0.7–1.3 cm. longi; pedicelli 6–9 mm. longi, cum pedunculis bracteisque indumento ei caulium simili obtecti; bracteae angustae, 2–3 mm. longae vel interdum inferiores usque ad 1 cm. longae. *Sepala* oblonga, apice rotundata, duo antica quam alia parum majora, 2 mm. longa, 0.75 mm. lata, omnia glabra. *Corollae* albae (ex *Kerr*) tubus late campanulatus, 3.75 mm. longus, apice circa 6 mm. diametro, glaber; labium posticum 2-lobatum, lobis rotundatis circa 3 mm. diametro, anticum e lobis tribus quorum laterales mediano paulo majores circa 2 mm. longi et lati constitutum. *Filamenta* 3.5 mm. longa, superne incrassata, complanata, incurva; antherae 2.75 mm. longae, supra medium firme cohaerentes. *Pistillum* 7 mm. altum, glabrum, disco vix evoluto. *Fructus* vix maturus, gracilis, stylo persistente incluso 3 cm. longus.

Doi Sutep, on humus on rocks by stream in evergreen jungle, 600 m., *Kerr* 1973.

Ornithoboea Wildeana, Craib [Gesneraceae—Cyrtondreae]; ab *O. Lacei*, Craib, cui proxime accedit, corollae labii inferioris lobis apice haud emarginatis recedit.

Caulis viridis, glanduloso-albido-pilosus. *Folia* opposita vel subopposita, inaequilateralia, latere altero dimidiatum ovata, altero dimidiatum ovato-lanceolata, apice acuminata, basi inaequalia, saepe anguste cordata, ad 10 cm. longa et 6·7 cm. lata, membranacea, supra viridia, pilosula, subtus pallidiora, praesertim ad costam nervosque pilosa, nervis lateralibus utrinsecus ad 10 infimis patulis medianis arcuatis supremis satis obliquis, crenata, petiolo usque ad 5·7 cm. longo glanduloso-piloso suffulta. *Inflorescentia* generis, axillaris, pedunculo communi circiter 2 cm. longo ut caule glanduloso-piloso apice bracteis duabus linearibus glanduloso-pilosis circa 1·1 cm. longis et 1·75 mm. latis instructo suffulta; pedicelli 1–1·1 cm. longi, glanduloso-pilosi. *Sepala* post anthesin reflexa, usque ad 13 mm. longa et 3·5 mm. lata, extus glanduloso-pilosa, intra puberula. *Corollae* tubus 8–9 mm. longus, ore dense barbato-pilosus; labium inferius subquadratum, 9 mm. longum, apice 9 mm., basi 5 mm. latum, extra parce breviter pilosum et rubro-glandulosum, 3-lobatum, lobis oblongis integris 3·75 mm. longis 3 mm. latis; labium supremum inferiore multo brevius, lobulis 2 emarginulatis. *Stamina* 2, filamentis brevibus complanatis, antheris maiusculis, staminodiis duobus. *Ovarium* pilis glanduloso-capitatis et praeterea glandulis brunneis densius tectum; stylus pubescens, pilis infimis glanduloso-capitatis.

Described from a specimen raised in Dublin at the Trinity College Botanic Gardens from seed sent from Siam by Dr. A. F. G. Kerr.

Daphniphyllum Beddomei, Craib [Euphorbiaceae—Phyllanthaeae]; a *D. himalayense*, Muell. Arg., foliis fuscis subtus haud glaucis distinguendum.

Arbor circiter 15 m. alta (ex Kerr), omnino glabra vel ramulis juventute tantum minutissime sparse puberulis; ramuli primo fusi, plus minusve angulati, mox castanei vel atrii, conspicue lenticellati, teretes. *Folia* lanceolata, oblongo-lanceolata vel late oblongo-lanceolata, saepe parum inaequilateralia, apice acuminata, acuta, basi attenuato-cuneata vel cuneata, interdum acuminata, 9–21·5 cm. longa, 3·3–8·4 cm. lata, papyracea vel coriaceo-papyracea, nervis lateralibus utrinque circiter 12 intra marginem anastomosantibus supra prominulis subtus cum costa prominentibus, nervulis pagina utraque subprominulis, margine integra, cartilaginea, recurva, petiolo 2–4 cm. longo supra canaliculato suffulta; stipulae fugaces, 4 mm. longae. *Inflorescentia* ♂ axillaris, 2·2–2·5 cm. longa, glabra, rhachi fusca glabra ima basi perulis paucis interdum persistentibus interdum deciduis instructa; pedicelli 3 mm. longi; bractae deciduae. *Sepala* 3–4, albidia, oblonga quadratave apice irregulariter fimbriata denticulatave, circa 1 mm. longa. *Stamina* 9, filamentis brevibus, antheris crassis angulatis oblongis brevissime vel vix apiculatis. *Inflorescentia* ♀ ignota; infructescentia

circa 5 cm. longa, rhachi ima basi perulata; pedicelli 10–14 mm. longi; bracteae deciduae. *Fructus* vix maturus, ambitu subellipticus, parum compressus, circa 8 mm. longus et 5.75 mm. latus, apice stigmatibus duobus recurvis supra canaliculatis circa 1.25 mm. longis ornatus.

Pa Miang, Chê Sawm, evergreen jungle, 1200 m., *Kerr* 3101 (♂)

Distr. Burma: Amherst, Muleyit, 900 m., *Lace* 5607, *Beddome* (both ♀).

Beddome's plant was doubtfully included under *D. himalayense* in the Flora of British India (vol. v. p. 354).

Boehmeria siamensis, *Craib* [Urticaceae-Urticeae]; a *B. macrophylla*, Don, foliis pro longitudine latioribus haud bullatis distinguenda.

Frutex 2–2.5 m. altus; ramuli juventute parce strigillosi, plus minusve angulati et sulcati, cortice rubro-brunneo parce inconspicue lenticellato obtekti. *Folia* opposita, oblongo-lanceolata vel ovato-lanceolata, apice acuta vel attenuato-subacuminata, basi cuneata vel late cuneata, obtusa, 10–15 cm. longa, 4.5–5.5 cm. lata, chartacea, pagina utraque parce albo-strigillosa, e basi trinervia, nervis duobus lateralibus vix ad apicem excurrentibus cum costa supra subimpressis subtus prominentibus, nervis secundariis (e costa ortis) numerosis infimis fere rectis subpatulis, medianis arcuato-patulis, supremis arcuatis, margine, parte triente inferiore integra excepta, obtuse serrata vel crenato-serrata, petiolo 1–1.8 cm. longo supra canaliculato ut ramulis strigilloso suffulata; stipulae lanceolatae, vix 5 mm. longae, deciduae. *Spicae* ♀ nodo quoque 2–6, ad 9.5 cm. longae, e ramulis anni prioris ortae, parte basali 1–1.5 cm. longa bracteis sterilibus brunneis persistentibus ovatis circa 2.5 mm. longis imbricatis dorso praesertim ad medium breviter adpresse pubescentibus tecta; bracteae fertiles sterilibus similes, multiflorae. *Ovarium* in perianthio 3-lobato parce pubescente inclusum.

Chiengmai, Doi Sutep, 720–800 m., *Kerr* 538, *Hosseus* 455.

XLVIII.—FUNGI EXOTICI: XXI.

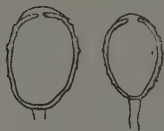
NEW UREDINALES FROM EAST AFRICA.

W. B. GROVE.

Uromyces Polygalae, Grove.

Sori uredosporiferi amphigeni, sparsi, rotundati, convexi, circa $\frac{1}{2}$ –1 mm. diam., epidermide rupta erecta cincti, compactiusculi, dilute brunnei; *uredosporae* globulosae vel ovoideae, 18–20 μ diametro, vel rarius ellipsoideae, usque $24 \times 12 \mu$,

sparse echinulatae, dilute fuscae, poris germinationis tribus subaequatorialibus instructae. *Teleutosporae* immixtae, paucae, ellipsoideae vel obovoideae, circa $20-22 \times 12-15 \mu$, verruculosae, brunneae, saepe apice papilla depressa latiore brunneola auctae, episporio 2μ crasso, pedicello hyalino deciduo sporam subaequante praeditae.

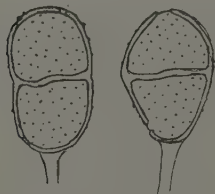
TELEUTOSPORES $\times 600$.

TROPICAL AFRICA. Uganda: Kipayo, 1220 m., March, 1915, Dummer 2324, on leaves of *Polygala persicariaefolia* DC., or a related species.

The sori were infested with great numbers of the pycnidia of *Darluka Filum*, Cast.

***Puccinia Erlangeae*, Grove.**

Sori *teleutosporiferi* hypophylli, sparsi, mediocres, 2-3 mm. lati, rotundati vel lineari-oblongi, umbrini, tomento folii plus minusve obiecti, pulverulenti, maculis obscuris insidentes;

TELEUTOSPORES $\times 600$.

teleutosporae ellipsoideae, utrinque rotundatae, apice non incrassatae, medio non vel lenissime constrictae, laxiuscule verruculosae, pallide brunneae, $32-40 \times 22-25 \mu$, episporio tenuissimo $1-1\frac{1}{2} \mu$ crasso, poro germinationis cellulae superioris juxta apicem, inferioris juxta pedicellum sito, pedicello plerumque curto hyalino deciduo praeditae.

BRITISH EAST AFRICA. Nairobi, Limoru, 2134 m., Feb., 1915, Dummer 1745, on leaves of *Erlangea tomentosa*.

This species belongs to the type of *P. Hieracii*, but is remarkable for its very thin wall.

***Puccinia exilis*, Syd. var. *Hibisci*, Grove.**

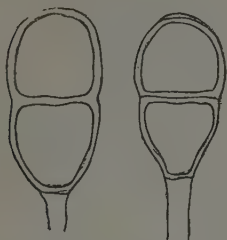
Varietas a typo differt maculis rufidulis, sori *teleutosporiferis* non solitaris, sed 6-12 in quaque macula dense congestis, *teleutosporis* maturis non subhyalinis, at flavo-brunneolis diaphanisque: caetera typi.

TROPICAL AFRICA. Uganda: Kirerema, 1220 m., March, 1915, Dummer 2326, on leaves of *Hibiscus* sp. in a swamp.

***Puccinia Hoslundiae*, Grove.**

Sori *uredosporiferi* amphigeni, sine maculis, subgregarii, minuti ($\frac{1}{4}$ mm. diametro), rotundi, pustulati, compacti, prominuli,

pallidi, epidermide cincti; *uredosporae* ellipsoideae, pallidae, subtiliter echinulatae, $22-25 \times 18-20 \mu$, episporio 2μ crasso; *teleutosporae* immixtae vel soris conformibus propriis segregatae, obovoideae, utrinque rotundatae, apice non incrassatae, medio vix constrictae, leves, saturate castaneae, $30-38 \times 20-22 \mu$, episporio 2μ crasso, poris germinationis non conspicuis, pedicello subhyalino curto vel sporam subaequalite praeditae.

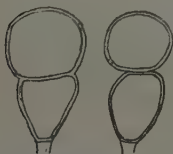
TELEUTOSPORES $\times 600$.

TROPICAL AFRICA. Uganda: Maigie, 1220 m., Nov., 1914. Dummer 1312, on leaves of *Hoslundia* sp.

This species presents a general resemblance to the smooth form of *P. Menthae*, Pers., but differs from it sufficiently in several details. There is at times a low flat cap covering the apex of the teleutospore, but this is generally wanting.

Puccinia necopina, Grove.

Maculae rotundatae, in superiore folii facie conspicuae, 2-5 mm. latae, cinereo-fuscae, purpureo-marginatae. *Sori teleutosporiferi* hypophylli, in maculis ochraceo-fuscis vix marginatis dense congregati, orbiculares, pustulati, $\frac{1}{8}$ mm. diametro, pallide ochracei, epidermide cincti; *teleutosporae* plus minusve clavatae, apice rotundatae vix incrassatae, constrictae, leves, hyalinae, $35-28 \times 15-18 \mu$, pedicello brevi hyalino praeditae, episporio tenuissimo, celulis demum facillime secedentibus.

TELEUTOSPORES $\times 600$.

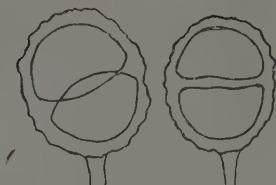
TROPICAL AFRICA. Uganda: Kipayo, 1220 m., March, 1915, Dummer 2325, on leaves of *Tristemma* sp.

This unusual-looking species occupies the rounded spots of the leaf completely with its very crowded minute pustules. The spots present a different appearance on the two surfaces of the leaf. The spores were mostly empty, having evidently germinated *in situ*, and the outer surface of each pustule was covered with a thick subgelatinous layer, apparently made up of the remains of the decayed basidia. Even when the spores were still full of protoplasm, they were all but perfectly colourless. The species seems to present some similarity to *P. albida*, D. & N., but the spores remind one of those of *P. Saginae*, K. & S., as figured in "British Rust-Fungi," fig. 169.

Puccinia pentadicola, Grove.

Sori uredosporiferi hypophylli, sine maculis, sparsi, minuti ($\frac{1}{4}-\frac{1}{3} \mu$ diametro), punctiformes, pulverulenti, saturate ochracei,

epidermide rupta cincti; *uredosporae* ellipsoideae, leves, flavo-brunneae, $20-23 \times 16-18 \mu$, episporio $1-1\frac{1}{2} \mu$ crasso, poris germinationis non visis. Sori



TELEUTOSPORES $\times 600$.

teleutosporiferi perfecte conformes, atro-brunnei; *teleutosporae* late ellipsoideae, utrinque rotundatae, apice non incrassatae, medio non contractae, verruculosae, im-

maturae laete uavae, dein atro-castaneae, $35-45 \mu \times 28-35 \mu$, episporia 4μ crasso, ex tunicis duabus composito, interiore tenui tenaci levi atro-brunnea, exteriori crassa brunneola molliore inaequaliter grosse verrucosa plus minusve secernibili, pedicello gracili hyalino deciduo sporam subaequante saepe oblique inserto praeditae.

TROPICAL AFRICA. Uganda: Mubango, 1220 m., Jan., 1915, Dummer 1344, on leaves of *Pentas verticillata*, var. *pubescens*. S. Moore.

This species seems to be intermediate between *P. Pentadis*, Henn. and *P. Pentanisiae*, Cooke, differing from the former in the verruculose external surface of the spore, and from the latter in the hypophyllous sori and thick episporium.

XLIX.—HOST PLANTS OF SYNCHYTRIUM ENDOBIOTICUM.

STUDIES FROM THE PATHOLOGICAL LABORATORY: IV.

A. D. COTTON.

Probably no disease of potatoes is attracting more attention at the present time than Wart Disease or Black Scab, caused by the fungus *Synchytrium endobioticum*, Perc. Although, except for a few isolated spots, it is absent from the south of England, in many of the northern counties and in part of Scotland it causes very serious loss, and in some localities it had become so virulent that a few years ago potato-growing in allotments and gardens had to be practically abandoned. With the discovery, however, of immune varieties potato-cultivation in these areas is being resumed, and the "seed" of high-class resistant varieties is so much in request that the demand at times far exceeds the supply.

The trials carried out at Ormskirk by the Board of Agriculture and Fisheries demonstrate beyond all doubt that certain varieties are not merely highly resistant but, for the present at any rate, absolutely immune to Wart Disease. Disappointment in the past as to immune varieties has been due either to (a) wrongly named "seed," or (b) to the presence of "rogues," or (c) to the use of varieties which, though formerly supposed

to be immune, had not been properly tested on badly and uniformly infected soil. Mr. J. Snell, who is in charge of the Board's experiments in Lancashire, is able to state that no varieties, the resistance of which has been thoroughly tested, have as yet broken down in this respect. The existence of varieties resistant to Wart Disease is singularly fortunate for potato growers, as in the case of certain other diseases, Corky Scab for example, all varieties appear to be susceptible.

In spite, however, of the inestimable value of the immune variety it is important to combat the Wart Disease fungus in other ways. Many of the best and most popular potatoes, such as Up-to-Date and King Edward, cannot be grown at all in infected areas. In some districts it is not easy to obtain sufficiently large quantities of resistant seed, whilst it is possible that disease-resistance in certain varieties may break down altogether after some years of cultivation. In addition to this the disease itself is slowly spreading. If it had not been for the vigorous measures enforced by the Board of Agriculture and Fisheries Wart Disease would almost certainly have been distributed by this time throughout the whole of England, but in spite of all precautions it continues to break out in new localities. Every research therefore which throws light on the biology of the fungus is important, as it is only by a complete and accurate knowledge of its life-history that means can be devised for destroying it.

Unlike the ordinary Potato Blight fungus (*Phytophthora infestans*) the Wart Disease organism is almost exclusively subterranean and passes the winter in the soil. No soil-treatment of practical value for killing the "spores" (strictly speaking these are sporangia as they liberate later a number of minute zoospores) has yet been discovered. The sporangia are enclosed in a very thick coat and apparently retain their vitality for a number of years. Many cases are known where Wart Disease has reappeared when clean potatoes have been planted on infected land after an interval of two or three years, and several well authenticated records exist of disease appearing after a six or seven years' interval.

Several explanations of such a recurrence of disease are possible. (1) The disease may have been unconsciously re-introduced by man, animals, water, or other agency. (2) The sporangia may not all germinate the first season but, after the manner of certain seeds, they may remain dormant and germinate irregularly in subsequent seasons. (3) The sporangia may germinate at once and the amœbæ produced from the zoospores may remain alive in the soil either in an amœboid or encysted condition. (4) The fungus may, in the absence of potatoes, have attacked other plants and managed to maintain an existence in their tissues.

Amongst other experimental work on Wart Disease which is being carried out at the Pathological Laboratory at Kew are a series of pot experiments designed to throw light on the above problems. The first explanation suggested above, namely re-introduction, is one for field observation, but for the second and third, material has been collected and a series of experiments

commenced. The results, however, will obviously not be available for several years. The last possibility suggested had often been thought of by growers, and the roots of all kinds of weeds which occur in diseased potato fields had been casually examined for traces of the fungus, but in no case had any excrescences referable to *Synchytrium endobioticum* been found. Definite experiments, however, were desirable.

Of the weeds which belong to the family *Solanaceae* there are only two which would be likely to occur at all frequently in potato plots, namely *Solanum dulcamara*, a wood and hedgerow plant, and *Solanum nigrum*, a common weed in parts of the south of England, and especially in the neighbourhood of London. The latter plant also occurs abundantly in certain Wart Disease areas.

As being the most likely of any to be susceptible to disease, it was decided to test in the first place these two *Solanums*. Pot experiments were therefore commenced this spring and a few results have already been obtained. Although the investigations are not complete, the results are of some importance and are worthy of record. It is hoped to publish next season a more detailed account. The experiments were as follows:—

Solanum nigrum. Seeds were sown on May 18th in pots of infected soil obtained from Ormskirk, Lancashire. Four pots were sown and the seedlings, which appeared about June 15th, were thinned out to six plants per pot. One pot was examined on August 7th. Four plants out of five were found to possess swellings at the base of the stem, in each of which the sporangia of Wart Disease could be detected with a lens. Sections showed the sporangia to be of the same size and general appearance as in the potato. The warts, though very small only 1–2 mm. thick, were plainly visible when the roots were carefully washed. They occurred in the region of the hypocotyl, and extended over an area of 3 or 4 mm. Details as to their mode of origin and place of infection are reserved till a later paper.

The remaining plants, some 18 in number, were not examined till September 13th, when no excrescences were present, nor, with the exception of one plant, were any sporangia found. In two or three cases the base of the stems had been injured, and it is possible that the injured area may have represented a wounded surface left by a small wart formed by *Synchytrium* which had fallen off.

Four other infected pots into which young seedlings of *Solanum nigrum* from Richmond were planted yielded negative results showing no signs of attack.

Solanum dulcamara. Seeds were sown on May 18th in four pots of infected soil obtained from Ormskirk. The seedlings appeared on June 5th. One pot was examined on August 7th and no sign of Wart Disease was detected. The remainder were examined on September 12th when one plant out of the six was found to possess the sporangia of *Synchytrium endobioticum*. These occurred in the tissues of the outer cortex. Very little or no hypertrophy of the tissues had taken place. The infected area was quite small, but was discernable with a

lens as being darker in colour. No disease was detected on the other plants, but owing to the very small infection which apparently takes place in this plant, it may have been overlooked.

Four plants, the result of dividing an old plant in spring, were also grown. These were examined on September 14th, but no Wart Disease was discovered.

These results show conclusively that Wart Disease is capable of attacking and infecting, though to a moderate extent, both *Solanum nigrum* and *S. dulcamara*. It is therefore quite possible that when attempts are being made to eradicate the disease by discontinuance of potato-growing or by the cultivation only of immune varieties, these two plants may act as hosts for *Synchytrium endobioticum*. The infected area is so small and inconspicuous that they may almost be said to act as "carriers." In actual fact, however, they have in the past probably been of little practical importance in fostering the disease.

Nevertheless, it should be remembered that *Solanum dulcamara* is generally distributed and common in the hedgerows in Britain and was noticed particularly in the hedges around the potato fields in infected districts in Lancashire last summer. *Solanum nigrum*, however, constitutes a greater danger; in the north it is rare, but in some of the Midland districts, where Wart Disease is widespread, it is not infrequent. In response to an inquiry, Mr. H. R. Wakefield kindly informed me that in the infected area of Glamorganshire the weed is locally frequent, and the same probably applies to the neighbouring counties of Carmarthen, Shropshire, and Monmouth. In two isolated areas in Hants and Surrey recently examined, *Solanum nigrum* was a common weed in infected allotments; therefore, any attempt to stamp out Wart Disease in such spots without paying attention to *Solanum nigrum* is not likely to be successful.

From the purely scientific side it is of interest to find that while certain varieties of *Solanum tuberosum* are immune, other species of *Solanum*, not apparently very closely related, are susceptible. This, however, is a well-known phenomenon in the case of fungus diseases of plants.

Of greater interest is the question of the original infection of the potato plant and the possibility of *Synchytrium endobioticum* having spread from wild Solanums to the potato. Wart Disease was first described from Hungary, and it is by no means inconceivable that a minute and hitherto unknown fungus such as *Synchytrium endobioticum* should have passed from wild plants to the cultivated either in that country or in any other where it was endemic.

The contrast between the small amount of hypertrophied tissue found in the woody stems of *Solanum nigrum* and the enormous excrescences developed from the soft parenchyma of the potato tuber is very striking, and may be partly attributable to the difference in the nature of the host tissue. But this factor is perhaps of minor importance, as the nature of the reaction of different host plants to the attack of the same invading parasite is more probably, as is the case with immunity itself, the result of deep-seated chemical differences.

L.—WELWITSCHIA MIRABILIS.

We have received from Professor H. H. W. Pearson, Director of the National Botanic Garden, Kirstenbosch, South Africa, a few weeks before his death, a copy of the S.W. African Protectorate Government Gazette of September 15th, 1916, containing the proclamation making provision for the preservation of *Welwitschia mirabilis*. It is a matter of the greatest satisfaction that it has been found possible under the stress of military occupation to make what we trust will prove adequate provision for the preservation of these unique specimens.

The following is the text of the Proclamation:—

Proclamation.

BY HIS HONOUR EDMOND HOWARD LACAM GORGES,
A MEMBER OF THE ROYAL VICTORIAN ORDER,
ADMINISTRATOR OF THE PROTECTORATE OF
SOUTH-WEST AFRICA IN MILITARY OCCUPATION
OF THE UNION FORCES.

No. 10, 1916.]

WHEREAS it is desirable to make provision for the preservation of the Welwitschia plant (*Welwitschia mirabilis*) (Native name "Garob") which has a known habitat in the locality of Pforte and Welwitsch situated between the Swakop and Khan Rivers in the district of Swakopmund, and in the Namib Desert and in the Kaokofeld, and may occur elsewhere in the Protectorate of South-West Africa;

NOW THEREFORE, under and by virtue of the powers in me vested, I do hereby declare, proclaim and make known as follows:

1. Any person, who, without authority from the Administrator (the burden of proof whereof shall be upon such person), injures, uproots or destroys any *Welwitschia* plant or removes from any such plant any portion thereof, shall be guilty of an offence.

2. Any person, who, without authority from the Administrator (the burden of proof whereof shall be upon such person) is in possession of any portion of any *Welwitschia* plant, shall be guilty of an offence, unless he shall have obtained such portion before the date of promulgation hereof.

3. Any person who sells or attempts to sell, or purchases or offers to purchase any *Welwitschia* plant or any portion thereof shall be guilty of an offence.

4. Any person who causes or procures any other person to do any act prohibited by the preceding provisions of this Proclamation shall be guilty of an offence.

5. Any person found guilty of an offence under the Provisions of this Proclamation shall be liable to a fine of £500 (Five

Hundred pounds) or in default of payment to imprisonment with or without hard labour for a period not exceeding two years.

GOD SAVE THE KING.

Given under my hand at Windhuk this 12th day of September, 1916.

E. H. L. GORGES,
Administrator.

LI.—MISCELLANEOUS NOTES.

MR. F. A. STOCKDALE, M.A., F.L.S., Director of Agriculture, Mauritius (*K.B.*, 1912, 392), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture, Ceylon, in succession to Mr. R. N. Lyne, resigned.

MR. H. A. TEMPANY, D.Sc., Government Chemist and Superintendent of Agriculture for the Leeward Islands, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture, Mauritius, in succession to Mr. F. A. Stockdale.

MR. J. H. HOLLAND, F.L.S., and MR. W. N. WINN, Assistants, Second Class, in the Royal Botanic Gardens, Kew, have been promoted to the grade of Assistant, First Class, with effect from 1st April.

H. H. W. PEARSON.—It is with very great sorrow that his friends at Kew have received the intelligence of the death from acute pneumonia of Dr. H. H. W. Pearson, at Mount Royal Hospital, Wynberg, Cape Town, on 3rd November, 1916, in his forty-seventh year. Henry Harold Welch Pearson was born at Long Sutton, Lincolnshire, on 28th January, 1870. His early education was obtained at private schools and by private tuition. In 1889 he matriculated in the University of London. In 1893 he gained an open scholarship of the Clothworkers' Company, tenable either at Oxford or Cambridge, and entered the latter university as a non-collegiate student in October, 1893. He was placed in Class I. of the Natural Science Tripos—Part I.—and graduated B.A. in 1896, entering Christ's College as a pensioner in the same year. In 1897 he was placed in Class I. of the Natural Science Tripos—Part II.—with botany as a special subject, and was elected Foundation Scholar and Darwin Prizeman of Christ's College. In the same year he visited Ceylon as a Wort's Travelling Scholar of the University, spending six months in the island in the study of tropical vegetation, and in pursuing original investigations. On his return to Cambridge in January, 1898, he was appointed Assistant Curator of the University Herbarium under the late Professor Marshall Ward,

F.R.S., and in June of the same year he was elected Frank Smart Student in Botany at Gonville and Caius College.

On 1st March, 1899, he became Assistant for India in the Herbarium at Kew, and in November of that year he was awarded the Walsingham gold medal for original investigations by the University of Cambridge, in which he proceeded to the degree of M.A. in February, 1900. In December, 1900, he was appointed an Assistant on the Kew staff in succession to Mr. I. H. Burkill. In 1903 he was appointed by the South African College Council to the Chair of Botany, now by a new foundation known as the Harry Bolus Professorship, in the South African College, Cape Town (*K.B.* 1903, p. 30). In 1901 he was elected a Fellow of the Linnean Society; in 1907 he proceeded to the degree of Sc.D., Cambridge, and in 1913 he became Honorary Director of the National Botanic Garden at Kirstenbosch, near Cape Town.

Already a young botanist of great promise, Pearson found from the outset of his South African career a congenial field of activity. He entered with zest into the work of botanical exploration, in which field he had already made for himself a reputation that will live along with those which attach to the names of Thunberg, Burchell, Baines and Schinz. His journeys, undertaken with the approval of Government, and in some instances with the assistance of scientific organisations, notably the Percy Sladen Trustees, enabled him to investigate botanically much hitherto unexplored or imperfectly known territory in South-West Africa from Namaqualand to Mossamedes, including more especially the Welwitschia Desert. The singular plant to which this region owes its name was the subject of especial study and afforded material for some of his weightiest contributions to natural knowledge.

During recent years he devoted especial attention to the study of the Cycads. With characteristic energy he brought together at Kirstenbosch living species of this family, and in the words of a South African friend whose appreciation of the deceased was printed in the "Cape Argus" of 4th November, "within three years he had obtained a collection which is second to none in the world." In a letter to a friend now serving at the Front, written a few weeks before his fatal illness, Pearson wrote "the Cycads are increasing in numbers and have reacquired the native dignity of beings that have seen the world make a fool of itself many times and expect to see it again many more times and still remain detached. Almost my greatest satisfaction just now is derived from the contemplation of Cycads."

His interests were, however, exceedingly catholic, so that the results of his labours in the floristic and economic fields have proved as valuable and enduring as those attained in the anatomical and phytogeographical branches of his especial science. As an administrative official he proved himself equally gifted, and the chief service he rendered to the country of his adoption was the part he was able to take in the establishment of the great National Botanic Garden at Kirstenbosch, on the slopes of Table Mountain, the honorary directorship of which was fittingly entrusted to his care. He was also the moving spirit in the

formation of the Botanical Society of South Africa in June, 1913. But not botany alone laments his premature death; the cause of science in South Africa has lost, in Pearson, a wise and devoted friend. "His death," says a South African writer, "occasions a blank which it is practically impossible to fill."

Pearson's outstanding worth came to be recognised in this country as it already was at the Cape; in 1916, he was elected a Fellow of the Royal Society, and his friends at Kew looked forward with confidence to the continuance of a career already distinguished by untiring industry, controlled enthusiasm, singular directness and unfailing tact.

Pearson, in 1902, married Miss E. Pratt, in whose bereavement those at Kew, by whom her late husband was held in such affectionate regard, feel a personal share. His remains were laid to rest on the afternoon of Saturday, 4th November, 1916, in a spot within the garden that he loved, facing the slope devoted to his Cycad plantation. The funeral service was held in the Protea Church, near the Kirstenbosch Estate, and the affectionate regard in which Pearson was held by all associated with the South African College was marked by the cancelling of all college engagements for that day.

The list of contributions here appended, conveys some impression of the varied interests and activities of our old colleague whose memory will endure in the great institution at Kirstenbosch, the establishment and welfare of which he had so much at heart.

List of Publications by the late Prof. H. H. W. Pearson.

Anatomy of the Seedling of *Bowenia spectabilis*, Hook. f. (Ann. Bot. xii. 1898, pp. 475-490, tt. 27-28.)

Apogeotropic Roots of *Bowenia spectabilis*, Hook. f. (Rep. Brit. Assoc. Adv. Sci. 1898, p. 1066.)

Botany of the Ceylon Patanas. Part I. (Journ. Linn. Soc. vol. xxxiv. 1899, pp. 300-365, with map).—Part II., by J. Parkin & H. H. W. P. (l.c. vol. xxxv. 1903, pp. 430-463, tt. 11-12).

S. Hedin's Reisen in Zentralasien. Die botanischen Ergebnisse, bearbeitet von W. Botting Hemsley & H. H. W. P. (Petermann's Geogr. Mitteil. Ergänzungsab. xxviii. 1900, pp. 372-375.)

Description of *Clerodendron Curtisii* (Kew Bulletin, 1901, p. 142).

On a Small Collection of Dried Plants obtained by Sir Martin Conway in the Bolivian Andes, by W. Botting Hemsley & H. H. W. P. (Journ. Linn. Soc. vol. xxxv. 1901, pp. 78-90, with map.)

The Flora of Tibet or High Asia; being a Consolidated Account of the various Tibetan Botanical Collections in the Herbarium of the Royal Gardens, Kew, together with an Exposition of what is known of the Flora of Tibet, by W. Botting Hemsley assisted by H. H. W. P. (Journ. Linn. Soc. vol. xxxv. 1901, pp. 124-265, with map.)

Descriptions of *Cochlearia Hobsoni*, *Geophila pilosa*, *Cuscuta Hygrophilae*, *Pentaphragma albiflorum* and *Vitex mooiensis*. (Hook. Ic. Plant, vol. xxvii. 1900-01, tt. 2643, 2691; vol. xxviii. 1901, tt. 2704-2706.)

Verbenaceae [of South Africa]. (Dyer, Flora Capensis, vol. v, sect. I., 1901 & 1910, pp. 180-226.)

On some Species of *Dischidia* with double Pitchers. (Journ. Linn. Soc. vol. xxxv. 1902, pp. 375-390, t. 9.)

The Teaching of Botany. (Rep. S. African Assoc. Adv. Sci. 1903, pp. 312-316.)

The Double Pitchers of *Dischidia Shelfordii*. (Ann. Bot. vol. xvii. 1903, pp. 617-618.)

South African Verbenaceae. (Trans. S. African Phil. Soc. vol. xv. 1905, pp. 175-182.)

Notes on some South African Cycads. (Rep. S. African Assoc. Adv. Sci. 1905-06, p. 260; Trans. S. African Phil. Soc. vol. xvi. 1906, pp. 341-354, tt. 6-8 & 1 text-fig.)

Some South African Cycads: their habitats, habits and associates. (Rep. Brit. Assoc. Adv. Sci. 1906, pp. 738-739.)

Some Observations on *Welwitschia mirabilis*, Hooker f. (Phil. Trans. R. Soc. B. vol. cxviii. 1906, pp. 265-304, tt. 18-22.)

Further Observations on *Welwitschia*. (Phil. Trans. R. Soc. Lond. B. vol. cc. 1909, pp. 331-402, tt. 22-30.)—[Abstract.] (Proc. R. Soc. Lond. B. vol. xxx. 1908, pp. 530-531.)

Descriptions of *Connaropsis acuminata*, *Cuscuta Upcraftii*, *Euthemis ciliata*, *Semecarpus cinerea* and *Swintonia puberula* (Kew Bulletin, 1906, pp. 2-5.)

The Living *Welwitschia*. (Nature, vol. lxxv. 1907, pp. 536-537, with 3 figs.)

A Botanical Excursion in the Welwitschia Desert. (Rep. Brit. Assoc. Adv. Sci. 1907, p. 685.)

Some Observations on the Welwitschia Desert. [Abstract.] (Rep. S. African Assoc. Adv. Sci. 1907, p. 116.)

Research on South African Cycads, and on *Welwitschia*. Report to the Committee. (Rep. Brit. Assoc. Adv. Sci. 1907, pp. 408-409.)

A Note on the Morphology of Endosperm. (Rep. Brit. Assoc. Adv. Sci. 1908, p. 914.)

The Travels of a Botanist in South-West Africa. Percy Sladen Memorial Expedition, 1908-9. (Geogr. Journ. vol. xxxv. 1910, pp. 481-511, with 12 figs.)

A Botanical Journey in South-West Africa. (Gard. Chron. 1909, vol. lvi. pp. 369-370, 401-402, 414-15, figs. 160, 162, 176-178, 182-184.)

Percy Sladen Memorial Expedition in South-West Africa, 1908-9. (Nature, vol. lxxxi. 1909, pp. 466-467, 499-500, with 4 figs. and 2 sketch-maps.)

Welwitschia mirabilis. (Gard. Chron. vol. xlvii. 1910, pp. 49-51, figs. 31-33 & suppl. illust.)

A National Botanic Garden [for South Africa]. Presidential Address. (Rep. S. African Assoc. Adv. Sci. 1910, pp. 37-54. Abstract in Kew Bulletin, 1910, pp. 372-380.)

The Embryo of *Welwitschia*. (Ann. Bot. vol. xxiv. 1910, pp. 759-766, t. 64 & 2 text-figs.)

Thymelaeaceae [of Tropical Africa]. (Dyer, Flora of Tropical Africa, vol. vi. sect. I. 1910, pp. 212-255.)

Preliminary Report on an Investigation of the Life History of the Rooibloem or Witchweed [*Striga lutea*, Lour.]. (Agric. Journ. Union S. Africa, vol. ii. 1911, pp. 266-268.)

On the Rooibloem (Isona or Witchweed). (Agric. Journ. Union S. Africa, vol. iii. 1912, pp. 651-655; Union S. Africa, Dep. Agric. [Leaflet] No. 30, 1912, pp. 1-7.)

The Problem of the Witchweed. (Agric. Journ. S. Africa, vol. vi. 1913, pp. 803-805; Union S. Africa, Dep. Agric. [Leaflet] No. 40, 1913, pp. 1-34, with 9 figs.)

Harry Bolus, D.Sc., F.L.S. [Obituary Notice, with a list of his botanical journeys, by L. Kensit, and a bibliography]. (Rep. S. African Assoc. Adv. Sci. 1911, 69-79, with portrait.)

Through Little Namaqualand with the Vasculum and the Camera. (Gard. Chron. 1911, vol. 1. pp. 61-62, 124-125, 166-167, 190-191, 200-201, figs. 30-33, 57-61, 79-81, 89-91, 97-99.)

On the Collections of Dried Plants obtained in South-West Africa by the Percy Sladen Memorial Expeditions, 1908-1911. (Ann. S. African Mus. vol. ix. 1911, pp. 1-19, with map.)

Itinerary of the Percy Sladen Memorial Expedition to the Orange River, 1910-1911. (Ann. S. African Mus. vol. ix. 1911, pp. 21-90, tt. 1-2.)

List of Plants collected in the Percy Sladen Memorial Expeditions, 1908-9, 1910-11. Portulacaceae, by H. H. W. P. & E. L. Stephens. (Ann. S. African Mus. vol. ix. 1912, pp. 30-35.)—Verbenaceae. (l.c. vol. ix. 1913, pp. 183-184.)

Note on the localities visited by the Percy Sladen Memorial Expedition to the Khamiesberg, Gifberg, and Oliphant's River Mountains, September, 1911. (Ann. S. African Mus. vol. ix. 1913, pp. 129-131.)

Le Vaillant's Grotto at Heerenlogement. (Geogr. Journ. vol. xxxix. 1912, pp. 40-47, with sketch-map and 3 figs.)

On the Microsporangium and Microspore of *Gnetum*, with some notes on the Structure of the Inflorescence. (Ann. Bot. vol. xxvi. 1912, pp. 603-620, t. 60 & 6 text-figs.)

The National Botanic Garden [for South Africa]. (Gard. Chron. 1913, liv. pp. 150-151, with sketch map.)

On the Flora of the Great Karasberg. Introduction. (Ann. Bolus Herb. vol. i. 1914, pp. 1-8.)

Observations on the Internal Temperatures of *Euphorbia virosa* and *Aloe dichotoma*. (Ann. Bolus Herb. vol. i. 1914, pp. 41-66.)

Note on the Inflorescence and Flower of *Gnetum*. (Ann. Bolus Herb. vol. i. 1915, pp. 152-172, tt. 24-26.)

Annals of the Bolus Herbarium, edited by H. H. W. P., vols. I.-II., pt. I., 1914-16.

Notes on the Morphology of Certain Structures concerned in Reproduction in the Genus *Gnetum*. (Journ. Linn. Soc. xliii. 1915, pp. 55-56.)

E. G. KENSIT.—We regret to record the death of Mr. E. G. Kensit, a member of the staff of the Bolus Herbarium, South African College, since 1912. Mr. Kensit was killed in action on 17th July, at Delville Wood.

The Galpin Herbarium.—From South African newspapers we learn that Mr. E. E. Galpin, F.L.S., an esteemed correspondent of Kew, has presented to the South African Government the valuable collection of South African and other plants formed by him during the past twenty-seven years.

The following particulars of the Galpin Herbarium have been supplied to the "Queenstown Daily Representative" by Mr. I. B. Pole Evans, Chief of the Division of Botany:—

"The Galpin Herbarium comprises the most valuable collection of South African and African plants that has ever been presented to any South African Government. It represents the collection of 27 years, made by Mr. Ernest E. Galpin, of Queenstown, who in March last offered his whole Herbarium with cabinets complete, etc., to this Department, as a donation under the following conditions:—

"1. That suitable provision be made for its housing, preservation and upkeep.

"2. That any botanist shall have access to it for purposes of study within reasonable hours and under proper control.

The Herbarium contains some 16,000 mounted sheets and over 30,000 duplicates. This generous offer was gladly accepted by the Hon. the Minister for Agriculture on behalf of the Union Government."

The herbarium has been deposited in the Botanical Laboratories of the Division of Botany of the Union Department of Agriculture at Pretoria, quarters which we understand are not entirely adequate for the purposes of a herbarium. It is to be hoped that in time it may be possible to provide for Mr. Galpin's munificent and public-spirited gift a building which will not only suffice for the housing of the specimens but will permit of this important collection being consulted by botanists to the extent that its scientific value demands.

Botanical Magazine for October, November and December.—

The plants figured are *Rosa Davidii*, Crep. (t. 8679), from China; *Thuranthos macranthum*, C. H. Wright (t. 8680), a South African Squill; *Stapelia Gettleffii*, Pott (t. 8681), from the Transvaal; *Callicarpa Giraldiviana*, Hesse (t. 8682), from China; *Dendrobium Palpebrae*, Lindl. (t. 8683), from Burma; *Telopea oreades*, Muell. (t. 8684), the Gippsland Waratah; *Cytisus monspessulanus*, Linn. (t. 8685), from the Mediterranean region; *Clematis afoliata*, J. Buch. (t. 8686), from New Zealand; *Artanema longifolium*, Vatke (t. 8687), a native of tropical Asia and Africa; *Rosa cerasocarpa*, Rolfe (t. 8688), a Chinese species; *Huntleya citrina*, Rolfe (t. 8689), an orchid from Colombia; *Sanguisorba obtusa*, Maxim., var. *amoena*, Jesson (t. 8690), from the mountains of Japan; and *Abies cephalonica*, Loud. (t. 8691), the Silver Fir of Greece.

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